Northern Rhodesia

Department of Agriculture

ANNUAL REPORT
for the Year
1954

Price: 2s. 6d.

1955
PRINTED BY THE GOVERNMENT PRINTER
LUSAKA

m.565—V65 6-55

COMMONWEALTH MYCOLOGICAL INSTITUTE
18 JUL 1955

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Department of Agriculture

ANNUAL REPORT FOR THE YEAR 1954

PART I—AGRICULTURE IN THE TERRITORY

INTRODUCTION

On the whole 1954 was a favourable year for agriculture in Northern Rhodesia. Although there were as usual slight local shortages of food crops, from a territorial point of view the year saw record sales of maize and groundnuts in the main producing areas. Climatically the season was interesting. Total rainfall figures were generally substantially below average and the season terminated earlier than usual. Against this, however, rainfall was well distributed and showers early in November gave an opportunity for early planting. On the whole there were very few complaints about the weather. " Army worm " caused some alarm in the middle of the season and control measures had to be used to safeguard crops in some areas but in general damage was negligible.

2. The continuing increase in the production of maize was reflected in a record crop. Sales to the Maize Control Board are expected to reach the unprecedented total of more than 1,250,000 bags which is about 100,000 bags in excess of consumption requirements for the year. Groundnut production also reached the highest ever—total sales were over 5,000 tons. This is striking proof of the progress being made as a result of the Government's policy of greater self-sufficiency in food crops.

3. Tobacco growers had a varied season. The average yield per acre of flue-cured tobacco was better than ever before but the total crop fell short of last year's record by about 25 per cent. due to a substantial reduction in the number of growers and to the voluntary restriction in acreage planted by individuals. Prices remained practically unchanged from last year. Eastern Province growers continued to fight an uphill battle for better prices but without result.

4. Mr. L. G. Troup, O.B.E., completed and submitted to Government his Report on a Commission of Inquiry into the European Farming Industry. In addition he reported separately on Land Tenure. The agricultural report contained the results of an economic survey that fully substantiated the views previously expressed in some quarters as to the high cost of developing farms and farming in Northern Rhodesia. Although the report has been published and made available to the public, it has still to be considered by the Government.

5. Conservation in the European areas received further impetus as a result of the introduction of what is called " regional planning ". For this scheme, which is carried out by the Conservation Section of the Department of Agriculture through the Natural Resources Board, the Government has provided a £50,000 subsidy and a similar sum for loans annually for an experimental period of three years.

6. The appreciation of the need for planning land settlement and agricultural development on sound lines was further reflected in the Copperbelt Soil and Land-use Survey and in the Ngoni Reserve. On the Copperbelt, alienation of land by the Land Board has been suspended for the time being pending the outcome of the survey. This display of patience by the Board, which includes representatives of the farmers and the Farmers' Union, is most praiseworthy especially in view of the very great demand for farm land and smallholdings by employees of the mining companies and others. Of the 2,700 square miles of the Crown land area of the Copperbelt, some 1,100 square miles was surveyed and the provisional mapping of the soil types was well in hand by the end of the year.

7. The Northern Rhodesia Farmers' Union amalgamated with the Rhodesia National Farmers' Union; in consequence the Annual Congress was discontinued and replaced by a general meeting in Lusaka at which topics of importance to farmers in Northern Rhodesia were discussed.

8. The Northern Rhodesia Agricultural Society's Agricultural Show was held at Lusaka from 31st July to 2nd August. It was opened by J. M. Caldicott, Esq., Federal Minister of Agriculture. The show was bigger and better than ever and reflected the continued increase and development in farming in Northern Rhodesia.

9. A Standing Committee on Agricultural Prices and Markets was set as an advisory body to the Federal Minister for Agriculture. Northern Rhodesia was represented on the committee by the Deputy Director of Agriculture. The deliberations so far have been confined to the question of a common producer price and organised marketing for maize throughout the Federation. Other commodities will come within the purview of the committee in due course.

MAJOR CROP REPORTS

Maize

10. There was a further increase in the cultivation of maize in both European and African areas. In consequence, and because the season was generally more favourable, production reached a new record for the second year running of 1,250,000 bags. This was considerably in excess of consumption requirements with the result that the carry-over stock was estimated at three-quarters of a million bags. Fortunately storage facilities have improved considerably in recent years so that half a million bags are stored in permanent buildings, including the silo at Lusaka. This still leaves some 300,000 bags in stacks under tarpaulins.

11. Maize continues to be the most reliable crop for European farmers, certainly on the red so-called " Upper Valley " soils of the maize belt and in addition to an increasing extent on sand veld following tobacco. The picture is brought up to date in the following table:

MAIZE PRODUCTION ON EUROPEAN FARMS

Season	*Acreage planted*	*Estimated total crop reaped (200 lb. bags)*	*Estimated bags per acre reaped*
1947–48	65,800	435,000	6.6
1948–49	74,040	370,500	5.0
1949–50	105,000	575,000	5.4
1950–51	98,265	467,000	4.7
1951–52	98,000	433,500	4.4
1952–53	105,000	602,343	5.7
1953–54	108,228	713,122	6.59

12. African production in the Central and Southern Provinces showed a spectacular increase over last year as shown in the following table of the combined total production for sale:

MAIZE PRODUCTION FOR SALE IN THE RAILWAY BELT

(Thousands of bags of 200 lb.)

Year	*European grown*	*African grown*	*Total*
1944	212	115	327
1945	273	202	475
1946	268	172	440
1947	190	54	244
1948	343	296	639
1949	283	61	344
1950	447	344	791
1951	399	290	689
1952	389	173	562
1953	602	435	1,037
1954	661	595	1,256

13. In the Eastern Province sales of maize again topped the 100,000 mark for the third year in succession, although the total was slightly less than last year. This is brought out in the following table:

MAIZE MARKETED IN THE EASTERN PROVINCE

Year	*Local production*	*Imports*	*Total*	*Exports*
1949	30,500	22,500	53,000	Nil
1950	48,000	12,000	60,000	Nil
1951	80,000	Nil	80,000	37,700
1952	101,000	Nil	101,000	77,670
1953	129,100	Nil	129,100	107,764
1954	101,186	Nil	101,186	65,000

14. Local consumption again dropped slightly, mainly through European farmers becoming more self-sufficient and consequently the proportion exported was greater. The large surplus gives some cause for concern as cultivation continues to expand in the railway belt and in Central Africa as a whole. The distances of the Eastern Province areas from railhead are great—Lusaka 250 to 350 miles and Salima 150 to 250 miles—and there is a possibility of difficulty in the future in disposing of the surplus at an economic price.

15. Consumption requirements remained about the same as in the previous year, namely 1,100,000 bags. The trend is upwards but it is tending to slow down; this is partly due to bountiful crops available in the reserves, especially in the vicinity of the consuming centres, partly to a reduction in the rate of development of European farming and industry, partly to increasing self-sufficiency by tobacco growers and partly because the urban Africans are eating more wheat products especially white bread.

16. The line of rail price at Maize Control Board depots was increased from 40*s*. 9*d*. to 41*s*. per 200 lb. maize net, i.e. excluding the bag. The cash payment for African maize at rural buying depots was increased to 28*s*., the balance after meeting rural buying expenses being credited to the African Farming Improvement Fund which is used to finance schemes for the benefit of the Africans in the areas whence the maize comes. In the Eastern Province the price was unchanged at 16*s*. 6*d*. per 200 lb. to producers at rural depots plus 2*s*. 6*d*. contribution to the Eastern Province African Farming Improvement Fund.

17. The orderly marketing of the crop was carried out by the Eastern Province Agricultural Produce Board who employed the Petauke Co-operative Marketing Union, the North-Eastern Rhodesia Co-operative Society and the Fort Jameson Garage and Milling Company as agents on contract.

Wheat

18. Production was again negligible. Despite the relatively high price of 70*s*. per bag being guaranteed there was a further falling off in local production which amounted to only 197 tons. At the same time consumption continued to increase. On the basis of actual milling output from the Territory's two mills consumption was 20,952 tons in 1954. A determined effort is being made by the Department of Agriculture to find ways and means of increasing local production; a Plant Breeder has been appointed and the experimental programme includes trials with more than 500 varieties of wheat from all parts of the world.

Tobacco

19. The tendency towards consolidation of the tobacco industry on the basis of sound long-term planning and quality is reflected in the following figures:

TOBACCO PRODUCTION

(in lb. weight)

Season	*Flue-cured Virginia*		*Total*	*Other Virginia*	*Burley*	*Turkish*		*Total all types*
	E.A.	*W.A.*		*(a)*	*(a)*	*E.A.*	*W.A.*	
1943–44 ...	2,058,000	240,000	2,298,000	*	54,000	—	80,000	2,432,000†
1944–45 ...	2,207,000	243,000	2,450,000	31,000	85,000	20,000	403,000	2,989,000
1945–46 ...	2,823,000	307,000	3,130,000	43,000	77,000	28,000	1,000,000	4,278,000
1946–47 ...	2,928,600	500,000	3,428,600	83,000	125,000	26,500	1,000,000	4,663,100
1947–48 ...	2,988,000	781,500	3,769,500	*	140,000	—	858,590	4,768,090†
1948–49 ...	4,076,300	1,691,600	5,767,900	*	178,800	—	97,000	6,043,700†
1949–50 ...	3,214,500	2,956,500	6,171,000	42,500	327,100	—	115,330	6,655,930
1950–51 ...	4,413,894	6,262,457	10,676,351	50,000	252,879	—	49,368	11,028,598
1951–52 ...	4,104,669	5,418,723	9,523,392	25,000	124,180	—	50,000	9,722,572
1952–53 ...	3,584,444	6,739,094	10,323,538	*	106,557	—	30,356	10,460,451†
1953–54 ...	2,809,051	5,176,089	7,985,140	11,000	100,556	—	37,000	8,133,696

NOTE.—(*a*) = Production confined to Eastern Area.
E.A. = Eastern Area.
W.A. = Western Area.
* = Not obtainable.
† = Incomplete.

(*a*) *Flue-cured Virginia Tobacco*

20. By and large weather conditions were favourable in all districts and on the whole it was a good growing season. Comparative figures for the two areas for this year and for the past few years are as follows:

Season	*Registered growers (No.)*	*Acreage*	*Production (lb.)*	*Average price per lb. d.*
		WESTERN AREA		
1951–52	304	16,740	5,419,000	32.25
1952–53	267	14,000	6,739,000	34.92
1953–54	215	9,331	5,176,089	34.88
		EASTERN AREA		
1951–52	203	11,000	4,220,000	20.71
1952–53	135	6,200	3,584,000	27.37
1953–54	110	5,100	2,809,051	27.47

21. All flue-cured Virginia grown in both the Eastern and Western areas was sold over the tobacco auction floors at Salisbury. The season opened with prices for top grades of leaf remaining firm at a high level but all other qualities received prices uneconomic to the grower. This resulted in those farmers who had sold a large proportion of their crop early in the season suffering severe financial embarrassment. After the Easter recess, however, the market reopened on a firmer tone and the big differentiation between prices for top and middle grades diminished. The result was a considerable improvement in the overall picture for the farmer.

22. It is difficult to make comparisons between prices paid for Southern Rhodesian and Northern Rhodesian tobacco as it was not until fairly late in the season that the Marketing Board agreed to classify North-Western leaf; North-Eastern remained unclassified. However, it is safe to say that grade for grade North-Eastern tobacco again received lower prices than North-Western which, in turn, were slightly below Southern Rhodesian.

23. The standard of grading and handling of the North-Eastern crop was to be commended. Unfortunately the standard of grading of North-Western leaf left very much to be desired.

24. The pattern of buying during the season under review, particularly during the opening stages, shows clearly that in future the demand will remain firm for top quality leaf only and that success, as far as the farmer is concerned, will be determined to an increasing extent by the diminishing quantities of nondescripts he has on offer.

(*b*) *Turkish*

25. As Turkish tobacco is not sold over the floors but by private treaty, accurate statistics of production are not available. It is estimated, however, that sales amounted to 37,000 lb. valued at £5,692, all from the North-Western area. There has been a considerable increase in the number of growers this incoming season.

(*c*) *Burley*

26. As hitherto, production was confined to the Eastern Province and there were signs of increased interest among European growers. The crop was sold over the auction floors at Limbe and realised an average price of 25.97 pence per lb. for 100,556 lb. as compared with 29.56 pence per lb. for 106,557 lb. in 1952–53.

Pulses

27. It was a most unfavourable season throughout the Territory for beans, cowpeas and pulses generally. In consequence, production, never of much significance, was much less than usual. The Eastern Province, which normally produces several thousands of bags of pulses for sale, had a total surplus of 1,330 bags. In other provinces the position was no better, e.g. Abercorn and Kasama purchases amounted to only forty-two bags. Producer prices in the Eastern Province were 20*s*. per bag for cowpeas, 39*s*. per bag for sugar beans, 30*s*. per bag for pigeon peas. It is recorded that 2,596 acres of cowpeas and beans planted by European farmers in the Central Province yielded only 2,890 bags, most of which was retained for rations and seed.

Groundnuts

28. Production was entirely by African cultivators mainly in the Eastern and North-Western Provinces. Elsewhere the crop is chancy and unpredictable and cultivation remained at negligible proportions. Conditions were not as favourable as usual in the North-Western Province, and consequently sales in Balovale, Kabompo and Chizera amounted to only 340 tons, which was rather less than half the total in the previous year. On the other hand, climatic conditions were exceptionally favourable in the Eastern Province where production reached a record high level, being more than twice that of last year.

Groundnut Production in Eastern Province

(in bags of 180 lb. kernels)

Season		*Fort Jameson*	*Katete*	*Petauke*	*Lundazi*	*Total*
1951–52	...	900	900	1,200	1,250	4,250
1952–53	...	6,000	7,500	12,000	890	26,390
1953–54	...	22,122	10,350	26,350	355	59,177

29. This spectacular increase in cultivation and production can be attributed, in considerable measure, to the cumulative effect of the Government's policy of encouraging groundnut production through guaranteed prices and markets and sustained effort on the part of the extension staff of the Department of Agriculture over the past four years.

30. Marketing arrangements for the surplus remained the same as in the previous year. Government, through the Maize Control Board, provided a guaranteed market at £50 per short ton at depots on the railway line. A proportion of the crop was used locally but the bulk of the crop was exported.

31. At Petauke a small pilot mechanical oil expressor of Japanese origin was installed by the Petauke Co-operative Marketing Union Ltd. Although the output was small and efficiency of extraction low (30 per cent. oil; 63 per cent. cake; 7 per cent. loss) the experiment has demonstrated that further investigation is justified into the possibility of establishing an economic industry on a reasonable scale, especially in view of the increasing demand for oil cake.

32. Growers were warned that the guaranteed price for next season will be reduced to £45 10*s*. per ton but this has not damped their enthusiasm in any way; on the contrary, cultivation in the Eastern Province has increased.

Rice

33. It was a particularly bad season for rice throughout the Territory and the developing industry received a severe set-back.

Cotton

34. It was a disappointing year for cotton. In the Eastern Province the production of seed cotton was 76,000 lb., a reduction of 40,000 lb. as compared with last year. A contributory factor was that European farmers in the area dropped the crop entirely. The lint was sold, in part locally and the balance to the Southern Rhodesia Cotton Research Board for 28 pence per lb. for clean lint and 23 pence per lb. for stained—both prices at Fort Jameson.

35. Cotton growing went out of favour amongst European growers in the railway belt; only some 45,423 lb. were sent for ginning, valued at £1,240. In this area conditions are not altogether suitable for cotton and it is, therefore, unlikely that production will go up at present prices in the circumstances.

Potatoes and Onions

36. The position was unchanged. Production, always unpredictable, continued to fall very far short of requirements, the shortfall being made up by imports from South Africa.

Cassava

37. The position was unchanged. There was the usual local trade between the Balovale–Kabompo area and Barotseland, but on a reduced scale. Elsewhere cassava remains primarily a famine reserve food crop.

Sorghum and Small Grains

38. Millet and small grains continued as staple subsistence crops in outlying areas but the tendency is undoubtedly towards their replacement by maize in most areas where commercial agriculture is beginning. The beer halls in the town continued to provide a market for limited quantities of sorghum, but production was rather less than normal and small consignments were imported from Southern Rhodesia, where it could be obtained at a much lower price than that which has obtained in Northern Rhodesia in recent years.

STATISTICS OF EUROPEAN AGRICULTURE

39. There was no change in the method of collecting statistics of European farming which was carried out by the Department of Agriculture for transmission to the Central African Statistical Office. The trend and rate of progress are illustrated in the following comparative figures:

	1950–51	1951–52	1952–53
Total number of farms	1,099	1,130	1,268
Total area of farms (acres)	4,136,156	4,571,668	4,599,000
Total area under cultivation (acres) ...	191,896	190,489	216,738
Total area planted in maize (acres) ...	102,185	104,542	110,506
Total area green cropped (acres) ...	36,107	29,162	38,338
Total area under irrigation (acres) ...	3,902	3,972	5,051
Total area planted in tobacco (acres)...	22,290	23,806	22,107
Number of cattle	127,387	121,395	129,196
Number of sheep and goats	6,511	7,061	5,999
Number of pigs	6,614	7,808	8,739
Fertilisers used (short tons)	6,574	7,545	9,754

PART II.—THE WORK OF THE DEPARTMENT

GENERAL POLICY

40. A concise statement of the aims of the department was given in last year's report. It is, however, so important to keep the target clearly in view that there is every justification for repeating the statement here. The department is concerned to develop and stabilise a prosperous farming industry in the European and African areas which will ensure a reasonable measure of self-sufficiency in essential foodstuffs and at the same time broaden the Territory's overall economy.

41. In the European areas the main lines of approach are by attention to—

(i) Sound land use planning on a regional watershed or group basis as well as on individual farms.

(ii) Improving soil fertility by all possible economic means including regular green cropping and sound fertilising practice.

(iii) Soil and water conservation, and the development of irrigation.

(iv) Improvement in the quality and yield of tobacco by intensive and improved methods and techniques of production and handling.

(v) Diversification of agriculture on the basis of mixed farming within economic limits.

42. In the African areas, rural development is based on investigation and sound planning on the following lines:

(i) Stabilising the population on the better areas of soil through planned development and the introduction of permanent systems of farming.

(ii) Protection of natural resources by land-use planning on watersheds, controlled clearing, fire control, contour farming, rotation of crops, mixed farming, rewards for good farming practices, replacement of sledges by carts, development of water supplies, controlled grazing and generally to facilitate the change-over from a subsistence to a cash economy without endangering the soil.

(iii) Improving living standards by the encouragement of new crops such as rice and groundnuts, which provide a safeguard against famine and a return on development capital.

(iv) Providing loan capital for development in suitable areas under control of the native authorities.

STAFF AND ORGANISATION

43. The organisation of the department continued unchanged from last year with some improvement in the staff position, more particularly in the conservation and specialist branches. The staff list (Appendix I) shows the disposition of staff into the various sections. Decentralisation of the extension services on a provincial basis has worked well in the Eastern and Northern Provinces and in Barotseland. In the railway belt, however, it has not been easy for the Provincial Agricultural Officers to co-ordinate European conservation and tobacco services with rural development in the African areas. This is partly due to the lack of suitably experienced senior agricultural officers. In addition, discussion has taken place on the question of European agricultural services becoming the responsibility of the Federal Ministry and this has undoubtedly had an unsettling effect and tended to cut across the policy that has been followed hitherto of strengthening the provincial agricultural administration.

Staff Changes

44. The death is regretted of two members of the staff, Mr. D. U. Peters, Agricultural Officer, in England after a long illness and Mr. L. H. Locke, Agricultural Supervisor (Tobacco), at Fort Jameson. The sympathy of all who knew them goes out to their bereaved families and friends. Mr. Peters was an authority on land-use survey in the native areas, and his loss at the early age of thirty-eight was a serious set-back to this important aspect of the department's work at this time.

45. There were several additions to the staff during the year as follows: J. S. Blacklock, Agricultural Officer, on transfer from Sarawak; P. Greening, Agricultural Officer; B. E. Mounter and J. Smartt, Plant Breeders on first appointment; A. M. M. Rees, Agricultural Economist, on transfer from the Secretariat; P. Brogan, Conservation Officer; E. P. Walsh, A. R. Maclachlan, P. M. McIntyre, J. H. Farwell, G. N. Ball, R. M. Wood, G. McI. Burnie, W. R. Lindsay-Stewart, J. Thomson, A. H. Farncombe, P.E. Anderson, W. H. Meyer, M. J. Lewis, as Agricultural Supervisors; Miss M. Lister and K. L. Dubber as Research Assistants. Dr. A. O. Ballantyne, Soil Scientist, joined the service on loan from the Colonial Pool of Soil Surveyors. On the other hand, B. C. Wills, Agricultural Officer, accepted transfer to Kenya on promotion; E. M. Clegg went on leave pending resignation; A. E. Twells, Assistant Tobacco Adviser, J. R. Duckworth, T. Davies, E. C. Rose, K. N. Bagshaw, I. G. Taylor, R. F. Chambers, K. P. Darby, B. N. de Vicq, H. C. Kermeen and L. C. Vaughan, Agricultural Supervisors, left the department. J. P. Hughes was promoted to Executive Officer (Conservation); G. Rowlands was appointed Clerk (Conservation); while H. S. Sanders and G. P. Broughton, male Clerks, left the service. E. F. Dowdall transferred from Agricultural Supervisor to Clerk. C. E. Johnson, Chief Agricultural Officer, remained for the first half of the year on special duty as Secretary to the Troup Commission of Inquiry.

SERVICES FOR EUROPEAN FARMING

Staff

46. The department's specialist and extension services for European farming were developed and improved on the basis of the organisation and disposition outlined in last year's report. At the end of the year the staff engaged whole time on European agriculture, including men on leave, comprised a Chief Conservation Officer and eight Conservation Officers, eight Agricultural Supervisors (Conservation), a Chief Tobacco Adviser, four Assistant Tobacco Advisers and two Agricultural Supervisors (Tobacco) and ancillary staff including fifteen Europeans on conservation machinery. In addition, all the specialist officers—particularly the Plant Pathologist, many of the Agricultural Officers, especially the Chief Agricultural Officer, Ndola, the Chief Agricultural Officer, Fort Jameson, the Senior Agricultural Officer (Irrigation), the Agricultural Officer (Experiments) at Mount Makulu, the Agricultural Economist, several Agricultural Supervisors, particularly the Supervisor in charge of the citrus and sub-tropical fruit station at Kambowa, and not forgetting the headquarters administration staff—all devoted at least half their time to European farming problems. For a country with little more than 1,000 effective European farmers, this represented an average proportion of rather more than one official for every fifty farmers, a fact which is not generally realised, and this does not include veterinary and animal husbandry services and land settlement officers who come under their respective departments. There is no doubt that the impact of all these services is beginning to have its effect, and is reflected in the continued development and improvement in the European farming industry. There was evidence of a growing confidence in the conservation services.

Troup Report

47. One of the most important developments to which the department made a substantial contribution was the publication of the Report of a Commission of Inquiry into the future of the European Farming Industry of Northern Rhodesia by L. G. Troup, O.B.E., and his additional Report on the Tenure of Agricultural Land. The former presents a clear picture of the industry as it was in 1952–53. It includes the results of an economic survey of a cross-section of farms which focuses attention to the high cost of development in this country. There is no doubt that the industry has over-reached itself financially. Mr. Troup has made fifteen recommendations and two suggestions. The reports have not yet been considered by Government.

Conservation Services

48. An approach to conservation through the medium of regional planning was accepted by the Northern Rhodesia Government, and is fast being developed beyond the experimental stage. A sum of £50,000 a year, for three years, has been granted to cover accepted subsidised works under this scheme. Further long-term loan conditions have been introduced to enable farmers to meet their financial responsibilities in the scheme. These grants will enable approximately 500,000 acres or about one-ninth of the European farming areas to be planned and developed over this period. Plans have to be approved by the Natural Resources Board and finally by the Member for Agriculture and Natural Resources.

49. This approach has entailed the establishment of a fully equipped planning office at Lusaka which produces from aerial photographs the working maps on a regional and farm level. Field control is then established and maps and reports are drawn up for each region, including correct land utilisation subdivisions, and works and development suited to the particular areas. Regional planning deduces from basic facts and figures the developments necessary to ensure correct land utilisation and the economic development of the natural resources: it provides a sound foundation on which to base individual farm plans. By the end of the year a total of 172,968 acres had been planned in the Upper Kaleya, Middle Kaleya, Cheta River and Chilongolo areas. A further 300,000 acres are being planned in other areas.

50. The following table summarises the achievements with mechanical conservation works on the line of rail (i.e. excluding the Eastern Province) during the past three years:

SUMMARY OF CONSERVATION WORKS ON LINE OF RAIL IN EUROPEAN AREAS

	1952	1953	1954
Area pegged for farmers (acres)... ...	1,358	3,000	3,000
Storm drains (yards)	31,038	27,650	53,120
Contour ridges (yards)	62,190	136,486	169,900
Waterway guide banks (yards) ...	11,480	10,100	—
Fence lines and fireguards (miles) ...	17	83	410
Roads (miles)	2	10½	49
Subsoiling (acres)	304	—	—
Bush clearing (acres)	1,305	3,914	3,214
Windrowing (acres)	35	373	—
Dams (number)	9	9	20
Dams capacity (million gallons) ...	30½	22	231
Small buffer dams, etc. (number) ...	82	—	32

51. It is gratifying to be able to record a growing co-operation between the conservation staff and the local road boards in the designing and clearing of roads.

52. A policy of regional firebreaks was accepted by the Natural Resources Board for a trial period. The aim is to subdivide districts by means of wide breaks specially cleared by the Conservation Units in such a manner that they can be maintained easily by the farmers themselves, in addition to their ordinary internal farm firebreaks. The response of the farmers has, so far, been disappointing and the policy is therefore under review.

53. Payment for work carried out for farmers is still far from satisfactory. Approximately £16,000 was outstanding at the close of the year in respect of works carried out prior to 1954. Steps are being taken to recover these arrears, and a new procedure for payment for conservation works has been introduced.

Tobacco Services

54. The tobacco industry was served by the Chief Tobacco Adviser based at headquarters in Lusaka and four Assistant Tobacco Advisers stationed in the four areas, Broken Hill, Lusaka, Choma and Fort Jameson. Some 1,875 visits were paid to farmers during the 1953–54 season and it can be claimed that every farmer who asked for a visit received one.

55. Farmers' Days were held at the Mochipapa (Choma) and Msekera (Fort Jameson) stations respectively, where varietal, cultural and fertiliser trials were demonstrated. These days were well attended and point to a growing confidence in the services provided.

56. The Plant Pathologist spent most of his time on tobacco problems, both in the field and in the laboratory.

Irrigation

57. The Senior Agricultural Officer (Irrigation) continued his investigations into proposed irrigation projects in the Chalimbana and Kaleya Valleys, in collaboration with the Department of Water Development and Irrigation. As far as the Chalimbana scheme is concerned there is need for another full rainy season's river flow data before the merits of one of the possible dam sites can be assessed. In the meantime, approximately 380 acres which form the western section of the present agricultural station have been demarcated for the purposes of a Pilot Irrigated Holding. This demonstration farm should provide the answers to many questions likely to arise in an irrigation settlement scheme in this valley.

Pastures

58. The Pasture Research Officer provided a good deal of technical guidance and assistance to Intensive Conservation Area Committees and to individual farmers. In particular the Broken Hill North Intensive Conservation Area and the Choma Intensive Conservation Area were assisted in starting grass nurseries. The Kambowa, Chalimbana, Mochipapa and other agricultural stations distributed considerable quantities of planting material to many farmers.

Chemical Analyses

59. More than 500 analyses were carried out at the laboratory at Mount Makulu. These included 300 soil samples from the Copperbelt and seventy-eight soil samples from tobacco farms. Amongst the miscellaneous materials investigated were fertiliser mixtures, lime, kraal manure, bat guano, soil for arsenic contamination, tree seeds, shrimps, crude native maize bran, wheat screenings, maize cyclone dust, silage, local groundnut cake, edible salt deposit, irrigation salt deposit, water and samples of tobacco leaves for mineral deficiency.

SERVICES FOR AFRICAN FARMING

60. The department now has thirty-four stations serving as extension centres for African agriculture, located throughout the Territory; in 1948 there were only thirteen such centres. Although some of the stations are new and extension services are only beginning, already the effect is becoming appreciable, and in some areas, notably the Eastern Province, the rate of advancement has been spectacular. Such rapid development is not without its problems, some of which, such as marketing, are relatively straightforward. More difficult are the technical and fundamental agricultural problems which take time for their solution; with these the department has made progress through carefully controlled experiments at numerous centres. The basic information obtainable from detailed soil and land-use survey is still lacking, but a useful start has been made in the Ngoni Reserve which will set the pattern for similar developments in the future.

Conservation

61. Until improved farming techniques can be demonstrated and adopted by the people, it is imperative to prevent any acceleration in erosion or deterioration in the native areas as commercial exploitation of the soil displaces the old subsistence cultivation. The department has continued to press forward with simple soil conservation measures in all areas.

62. One eroded, over-populated valley in the northern Ngoni area of Chief Kapatamoyo was treated as an intensive conservation area. This chief has co-operated well in the venture. A proportion of the villages was moved out of the area, all cultivation on stream banks, dambos and steep slopes was stopped and much gully control work undertaken, involving the construction of over 8,000 small stone check weirs from one foot to six feet high. Storm drains and graded contours were also constructed.

63. In October, an additional Agricultural Officer was posted to the Eastern Province in order to make a land-usage survey of the Ngoni country. A provisional plan for rehabilitating this area had been drawn up some years previously, but little progress has been made in its execution. The survey is designed to collect as much information as possible on the soil types, erosion damage and depletion of the soils, water supplies, areas of available grazing and arable land and timber supplies. The Provincial Administration are assisting in the survey and have posted a District Officer to it, to form a team of two. The District Officer is, at the same time, making a demographic survey of the area. On the completion of the survey, the more difficult tasks of reforming the rehabilitation plan in the light of the information gained and of executing the plan will be undertaken.

African Farming Improvement Schemes

64. As explained in the previous report, there are two such schemes, one on the line of rail, i.e. the Central and Southern Provinces, and the other in the Eastern Province. The various measures financed from the respective funds were continued as heretofore, without any major alterations.

65. In the Central and Southern Provinces sound progress was recorded on the following lines:

(*a*) *Improved Farmers' Scheme*

The number of improved farmers in the Southern Province who received bonuses in the 1953–54 season was 604 out of 677 who registered at the beginning of the season. A sum of £12,943 was paid out in bonuses. In the Central Province 212 improved farmers were successful, and £9,040 was paid out. The total number of successful farmers was, therefore, 816 in 1954 as compared with 824 last year. The falling off in the total number was due to the Southern Province having fifty-one fewer last year, which was compensated to some extent by an increase in the Central Province. There was no obvious explanation for the reduction, except that other measures of assistance may have proved more attractive and less exacting. The bonus remained at 27*s.* per acre for Grade A farmers and smallholders and 17*s.* for Grade B.

(*b*) *Ox Cart Subsidy*

This remained at 50 per cent. of the cost of carts delivered at rural buying depots, which resulted in selling prices of £17 17*s.* 6*d.* and £25 for steel-wheeled and rubber-tyred carts respectively. One thousand subsidised carts were sold in the Central and Southern Provinces during the year. It was apparent that many more carts would have been distributed and sold if better distributing facilities existed. Discussions were held with the manufacturers, with a view to putting the entire business onto a more efficient footing.

(*c*) *Assistance with Fertiliser and Green Manure Seeds*

The fertilisers were only subsidised to a small extent in respect of administrative and transport costs and in the way of delayed payment. Improved farmers in the Central and Southern Provinces bought seventy-three tons and 150 tons of fertilisers respectively, in the proportion twelve superphosphate to one of sulphate of ammonia approximately. Considerable quantities of sunnhemp and velvet bean seed were distributed to farmers on a replacement basis. It was gratifying to note an increasing number of cultivators outside the scheme have taken to ploughing-in green manure and the use of kraal manure.

(*d*) *Loans*

The committee administering the African Farming Improvement Fund approved the allocation of £2,000 each for the Central and Southern Provinces for loans to approved cultivators for the purchase of ploughs, planters, harrows, maize mills, wire for cattle kraals and the like. All applications for loans were laid before a committee consisting of the Provincial Agricultural Officer and the District Commissioner, the chief and a councillor of the district concerned. In the Central Province 114 loans were made to a total of £1,944. In the Southern Province £1,447 was loaned. This is the second year of this loan scheme; experience has shown that repayments were made promptly, and it would appear that the people appreciate their obligations as well as the advantages gained.

66. Although much smaller, the Eastern Province African Farming Improvement Fund is in a comparatively strong financial position. The rate of expenditure was roughly two-thirds of the current income of £12,500 for the year from the contribution of 2*s*. 6*d*. per bag to the fund. The following is a brief summary of the progress of the various activities for which the fund was used:

(*a*) The manure bonus scheme was designed to popularise green manuring practices by a cash payment for a certain minimum standard. Last season (1953–54) £1,065 was paid out and the indications are that this will be doubled next season.

(*b*) £370 was spent on subsidising improved kraals with a view to improving animal husbandry and making more manure.

(*c*) Two hundred and eleven subsidised ox carts were sold.

(*d*) £858 was lent for stumping, of which £11 was repaid, the balance not being due till next season. The amount of stumping achieved in individual cases with the assistance of a loan of £10 has been remarkable. This scheme has encouraged a great measure of self-help and increased the number of improved farmers, whilst at the same time relieving the department of a good deal of responsibility in opening up new farms.

(*e*) £990 was spent on minor subsidies for implements, legume seed and conservation works.

(*f*) The sum of £1,381 was advanced on repayment through co-operative societies for the purchase of eighty-five hand-operated groundnut shellers.

The Peasant Farming Scheme

67. This scheme differs from the so-called Improved Farmers' Scheme in that it is financed through the Central Government by means of a Colonial Development and Welfare Fund for the provision of loans to permanent farmers under a written agreement between the individuals with the native authority concerned. The scheme is territorial in scope and although financial control is centralised in the Development Secretary through the Commissioner for Native Development, the day to day administration is in the hands of the local area teams. Started in 1948 this scheme has made steady progress; there are now 480 peasant farmers in all and many on waiting lists.

68. Most progress has been made in the Eastern Province which enjoyed another prosperous year. The farmers demonstrated that they are not dependent entirely on a good season for success and that they can contend with unfavourable weather far better than the ordinary cultivator. The number of individual improved farmers operating in proximity to blocks of peasant farms is also increasing and they are fitting well into the scheme and broadening its scope.

Progress in Number of Peasant Farms in Eastern Province

		Katete	*Petauke*	*Fort Jameson*	*Total*
1950–51 ...	Block farms	26	—	—	26
	Individual farms ...	—	—	—	—
1951–52 ...	Block farms	26	—	8	34
	Individual farms ...	—	—	—	—
1952–53 ...	Block farms	39	16	20	75
	Individual farms ...	4	6	—	10
1953–54 ...	Block farms	60	33	23	116
	Individual farms ...	15	30	5	50
1954–55 ...	Block farms	82	35	30	147
	Individual farms ...	35	47	20	102

69. The increase in the number of peasant farms at Petauke is disappointing, but it is a net increase, several farmers who proved unsatisfactory being dispossessed of their farms. The individual type of farm is more popular in this district and there are fifteen block farms unoccupied. It is not anticipated that there will be any difficulty in finding tenants for these farms later.

70. The economic side of the scheme also reflects a satisfactory position. The cost of opening up and establishing a peasant farm in a block of farms varies between £130 and £170 and repayment of the loans over a ten-year period, commencing the second year of operations, is well up to date. Only very few farmers have defaulted in repaying the amount due and considerable numbers of farmers have repaid substantially more than the minimum amount. The capital cost of establishing an individual improved farmer is much less, about £40 per farm, due to the fact that many of these farmers already own a certain amount of equipment and stock and their farms are also partly cleared of tree stumps.

71. An outline of the income of peasant farmers is shown below:

PEASANT FARM INCOME

Type of farm	*Income per farm from first-year farms*	*Income per farm from established farms*
Petauke:	£	£
Block peasant farms	14	66
Individual improved farmers ...	41	59
Katete:		
Block peasant farms	45	56
Individual improved farmers ...	65	—
Fort Jameson:		
Block peasant farms	15	51

72. The above incomes represent only sales to organised markets; farmers also sold unrecorded amounts of produce privately in the Fort Jameson District particularly, these amounts were substantial. In addition, farmers receive bonuses for manuring, averaging £12 each for fully established farms. In some cases, large quantities of foodstuffs, mostly maize, were retained for labour rations in the following year and all farmers retained ample food supplies for their families.

73. Before the rains broke in November, the expansion programme for 1955 had been mapped out and the block farms had been surveyed and laid out for stumping early in 1955 and establishing in the 1955–56 season. In Katete twenty farms, in Petauke twenty-one farms and in Fort Jameson twenty-two farms had been thus marked out. The limiting factor controlling the number of new farms opened annually is the supply of work oxen. Difficulty was again experienced in obtaining the required number. In an attempt to open this bottle-neck holding herds of cattle have been established and immature cattle are now being bought and reared for issuing in later years. This also permits cattle to be purchased all the year round instead of as required. In Fort Jameson and Katete Districts, there is a long waiting list of applicants for peasant farms—more than it is possible to accommodate in one season.

74. In the Central Province the total number of peasant farmers was 120 distributed as follows:

Serenje	58
Munsakamba (Mkushi)	26
Muswishi (Broken Hill)	10
Keembe (Broken Hill)	10
Mumbwa	16
Total...	120

75. In this province the scheme is not at present meeting with the same degree of success as compared with the Improved Farming Scheme. This is due not to any shortcomings in the scheme itself but to poor soil conditions at Serenje, to lack of water at Keembe, to lack of cattle due to trypanosomiasis at Chibila (Mumbwa) and to poor soil and complex soil problems at Muswishi. It is admitted that on purely economic grounds the Serenje peasant farms are scarcely defensible. The soils are about as poor as any in the Territory. The average cash income recorded per farm over the past five years was only £12 per annum; it is known, however, that some farmers derived a further return through private sales not recorded. In addition, the families had their living; indeed the value of produce retained on the farms was estimated to be about £17 per farm. The total capital invested in the Serenje farms was £136 per farm on an average, of which a third was contributed gratis by Government in the early experimental stage in the way of housing, contouring, layout, transport, etc.; a third was advanced in kind, mainly cattle; a quarter was advanced in the form of loans for stumping and implements to be repaid, and the balance was contributed by the peasants themselves. The average indebtedness of the farmers was £31 16*s.* 6*d.* of which £26 was on account of stumping and clearing. In order to put the farms onto a more favourable footing financially it was decided that Government would write off part of its stumping and clearing cost in view of the special circumstances, i.e. mainly its experimental character. In spite of the rather gloomy picture presented by an economic review of the position at Serenje the scheme cannot be said to have failed. In the words of the District Commissioner: "The best that can be claimed and expressed in the plainest terms is that in five years fifty out of sixty farmers have been prepared to live on and cultivate permanent farms, using cattle and new agricultural methods.... These farmers have produced for sale an average of 700 bags per annum of necessary grain which is more than the sales from the rest of the district. The peasant farmer has become an important figure in the rural scene and with him has come the concept of farming for profit. He is a man of substance and the community in which he lives has amenities which are lacking in the village. He represents a better way of life where food is ample and

varied, where there are good houses and water supplies, and other benefits of a settled life. In this way his educative influence on the social side has been striking, but it does not compare with the impact that his improved methods of agriculture have made. Many want to follow but not perhaps within the framework of the present scheme. "

76. In the Western and North-Western Provinces there are only three groups—all in the Ndola Rural District. The Ndubeni group of five farmers of the Lima tribe were hampered by lack of cattle due to tsetse fly and they have, until recently, suffered from lack of supervision. The staff position has now improved, however, and it was possible in 1954 to establish settlements at Fiwale with twelve farmers of the Lamba tribe and at Nyenyeshi with fourteen Southern Rhodesian Africans. This last group looks very promising.

77. In the Northern Province the scheme has made uneven progress in the past, but this year there was a definite improvement and an indication that it is now steadily gaining momentum. The following is the establishment of farms up to date:

Abercorn District ...	Mwambala	39 farmers
Kasama District... ...	Ngulula	16 farmers
Chinsali District... ...	Shiwa Chasosa ...	10 farmers
Kawambwa District ...	Mushota	6 farmers
Fort Rosebery District ...	Ndoba	6 farmers
	Total	77 farmers

In addition, two new groups are in process of formation, namely at Chalwe near Mpika of ten to fifteen farmers, and at Chitimbwa in the Abercorn District of five farmers.

78. The cash income per farmer ranged from £10 to £40 at Ngulula and from £4 to £37 at Mwambala. At other groups development is at a too early stage for figures. Repayments of loans have been dilatory, partly due to insufficiently close supervision. This is being attended to, however, and there is no reason why repayments should not be brought into line with the high standard in the Eastern Province.

79. An interesting feature of the work in the Northern Province was the recording of so-called " individual " settlements with a view to the possibility that they might be integrated with the Peasant Farming Scheme. Five hundred and ninety-three of these individual settlements have been recorded. This development has raised important questions on land tenure which are exercising the minds of all concerned with the policy and administration of the Peasant Farming Scheme.

80. As an alternative to the Peasant Farming Scheme the Bemba Native Authority put up a suggestion in 1953 for what they called " Family Group Farming " whereby units of 300 acres would be demarcated for family groups. The department laid out a scheme together with a water furrow some three miles long, but in practice the authority has shown little real interest in it. Two of the farms were occupied and provided with loans for clearing and implements as in the peasant scheme, but it is too early yet for any progress report.

81. In Barotseland, the Lukalanya Valley Peasant Farming Scheme, sponsored by the Area Team, received the blessing and approval of the Paramount Chief and Kuta early in the year. It was decided to start with only four farms in the initial stage so as to study the agricultural conditions before embarking on a larger scale. Three farmers were in occupation by August. In spite of this rather late start, fair progress was reported and the farmers were able to complete an eight-acre programme by the end of the year. The peasant farms are about fifteen acres each; this has been found to be the most satisfactory size in other parts of the Territory.

82. To sum up, the total number of peasant farmers in the Territory established and operative under this scheme was just on the 480 mark by the end of 1954, as compared with a total of seventy in 1950.

Other Aspects of Extension Services in African Areas

Southern Province

83. An Agricultural Supervisor and African staff were posted to Gwembe where the prospect of the Kariba Dam provides an incentive for intensifying and improving agricultural methods and production in the valley. Demonstration plots were opened at Munyumbwe and at Chipepo Village.

84. In Namwala District, work continued on agricultural assistance for the co-operative societies who have their own African Farming Improvement Fund. The Co-operative Marketing Union made steady progress as reflected in the figures of maize purchases from members as follows:

MAIZE MARKETED

(bags of 200 lb.)

	From members	*From non-members*
1950–51	729	9,428
1951–52	1,150	5,542
1952–53	7,345	20,373
1953–54	15,712	13,582

85. Five very successful Farmers' Days were held at various agricultural stations and improved farms. The highlight of this activity was the Monze Agricultural Show held on 10th June, when about 2,000 people attended. Many European farmers and their families assisted in making what was undoubtedly a very good show.

Central Province

86. A survey of African-owned tractors revealed the following numbers and distribution:

	Tractors
Sala	7
Mumbwa	6
Broken Hill	2
Soli	5
Total	20

It was clear that there is a growing interest in mechanisation. Twelve tractor-owners undertook contract work and the department received many requests for assistance in this way. Ox-drawn ploughs, harrows, cultivators and planters are becoming quite common in the maize-growing areas. Consideration is now being given to plans prepared by officers of the department for a pilot peasant farming scheme including mechanisation.

87. At Chipapa, south of Lusaka, a small irrigation project was started, based on a dam. A one-acre plot was run as a demonstration to pave the way for a small settlement scheme next year.

Eastern Province

88. The African production of Burley tobacco at Petauke remained at a disappointingly low level, maize and groundnuts being preferred. But there is another reason for the decline of this crop which has to do with the fact that the Burley Growers Co-operative Society outgrew its strength. It became too large and unwieldy and dissatisfaction within the society adversely affected the producer. The need for reorganisation has been apparent for some time and steps were taken in 1954 to this end. The large society has been liquidated and will be replaced gradually by smaller compact multi-crop societies. These smaller producer co-operative societies will have more financial responsibilities; they will operate their own seed beds and be self-supporting. Charges for transport and grading will be fixed and overhead charges of the Marketing Union will be reduced. Growers will be registered and supervision will be provided by the Agricultural Department. This reorganisation should put the industry back on sound lines in the course of the next few years especially as Burley tobacco has now been included in the crop rotation on some of the peasant farms at Petauke.

89. At Petauke, Katete, Chadiza, Kalichero and Lundazi the use of demonstration farms was stepped up in addition to experimental work. Peasant farms, individual improved farms, school gardens and native authority farms were also used as demonstration centres. Field days were properly organised at each centre and large numbers of chiefs, councillors, headmen, school children and village cultivators attended and took a keen interest in what they were shown. The old attitude " the Bwana is able to do these things but they are not for villagers ! " is slowly dying out. Peasant and improved farmers have fully demonstrated that improved methods can be adopted in village gardens with advantage.

90. At Msekera, Petauke, Katete and Lundazi breeding herds of selected local cattle have been established following a definite breeding and selection policy.

91. A small irrigation project was developed at Lundazi below the dam. A brick-lined furrow was constructed to lead the water to fifteen quarter-acre fruit and vegetable gardens. The plot holders, mostly native authority and Government employees, made a promising start. The Lundazi-Chewa Native Authority is taking a leading part in promoting this scheme which may be expanded up to fifty acres of irrigated land.

North-Western Province

92. At Kasempa the Corridor Resettlement which was started two years ago is now well under way and progress may be summarised as follows:

Scheme	*No. of villages*	*No. of gardens*	*No. of gardens occupied*	*Area occupied (acres)*	*Total area (acres)*
Njenga No. 1	8	45	35	180	860
Njenga No. 2	2	20	—	—	712
Ingwe No. 1	2	16	16	80	590
Ingwe No. 2	8	54	32	160	1,920

The Njenga No. 1 Scheme is now in its third season and progress is satisfactory. One hundred bags of cereals and three bags of legumes surplus to requirements were sold this year. It is reported that the village headmen co-operated and worked well together. Indeed a sense of pride seems to have been engendered in the villages as the people have begun to appreciate that they are working out an idea that is, in fact, bringing them tangible benefits remarkably quickly. The Njenga No. 2 Scheme has only just been started. The Ingwe Schemes are now in their first season.

93. Two similar corridor resettlement schemes were started at Kabulamema Mission and Chifue in the Kabompo District. It may be explained here that the corridor system of resettlement was originally developed by the Belgians in the Congo in an attempt to rationalise shifting agriculture in areas of relatively poor soil where a bush fallow is the only practicable means of maintaining fertility. It does enable the people to enjoy some of the amenities of stabilised farming, for example improved water supplies.

Northern Province

94. The possibility of cotton as a cash crop in the Isoka District was investigated in the areas of Kampumbu, Muyeleka and Mweniwisi in the North Luangwa Valley. In the 1953–54 season forty-five growers volunteered for a small pilot scheme. They planted in all thirteen and a half acres, i.e. an average of a third of an acre each. An average yield of 200 lb. seed cotton per acre was obtained. This season, 1954–55, the number of volunteer growers has risen to ninety with an estimated forty acres in all. There is some doubt whether the scheme is economically sound in view of the distance from a market, and it will not be expanded beyond the pilot stage until every aspect has been fully investigated.

95. A small coffee-growing scheme was started in Isoka, sponsored by the native authority. Twenty-one people volunteered to plant trees but very little enthusiasm has been shown to date.

Barotseland

96. Although cassava and maize are the most important crops wherever they can be grown, the department continued to concentrate on developing rice-growing for which Barotseland has an enormous potential production. This work is discussed under the head " Pilot Schemes " later in this report. It has been an uphill task gaining the confidence of the Government and the people, but it can now be said that the extension services are accepted; in fact there is a growing demand for more Agricultural Assistants in areas outsde the immediate sphere of influence of the department at present. The native authority showed their desire for further agricultural extension when the Paramount Chief (in Katengo Council) approved the selection by the department assisted by the local chiefs of ten demonstration plots, two in each of five districts. Work in these plots was begun in September of this year. In Mankoya the native authority gave permission for two demonstration plots for the district but it was only possible to make a start with one at Kasabi this year: this was used for a rice variety trial and thirty-two assorted fruit trees interplanted with sunnhemp. A demonstration was attended by 175 growers.

School Farms and Gardens

97. In the Southern Province the close collaboration that exists between the Agricultural and African Education Departments was maintained and amply demonstrated by the provision of special courses for teachers at the Monze Agricultural Training School. Arrangements were completed for considerable alterations and additions to the school buildings especially the residential accommodation to allow for a full one-year course for teachers which will replace the normal course for Agricultural Assistants this incoming year and possibly in alternate years thereafter.

98. In the Central Province forty-five school gardens were regularly visited by agricultural staff. The Agricultural Supervisor at Serenje continued the regular courses of lectures and demonstrations at the area school.

99. In the Eastern Province co-operation was maintained and it is recorded that some progress has been made in improving the general standards of school gardens especially in the Lundazi District. Two categories of school gardens are recognised. First there are the conveniently and favourably placed garden sites of the Middle and Upper Schools which are supervised directly by officers and supervisors of the Agricultural Department and maintain a very high standard of agriculture equivalent to that practised by the best peasant farmers. The second category, consisting mainly of elementary village schools, is supervised by African Agricultural Assistants in the ordinary course of their extension work and only occasionally by the European staff; the standard of these school gardens is lower but nevertheless they serve a useful purpose. The attitude adopted by many school teachers that agriculture is beneath their dignity seems to be dying out and many school masters now take an enthusiastic interest in their school gardens.

100. In the Western Province, i.e. the Copperbelt and for practical purposes Ndola Rural District, advice was given to schools throughout; in particular at Chileshi the African Agricultural Assistant gave practical lessons twice weekly. The Agricultural Supervisor gave a lecture to teachers at Mindolo.

101. In the North-Western Province the department provided European supervision for eight of the twelve schools in the Kasempa District. A short course was held at the boma for native authority and Government African staff which resulted in closer co-operation in district work. The position at Kabompo has not been satisfactory and steps are being taken to rectify this.

102. The Northern Province has for long been noted for the highly developed agricultural bias in the schools. In the past there was an arrangement whereby the Principal of the Senga Hill School supervised certain school farms and gardens. This was changed in 1954 and control and direction of all school farms throughout the province became the responsibility of the Agricultural Department. The prize-winners in the Annual School Farm Competition were—

1st Prize: Luwingu School.
2nd Prize: Isoka School.
3rd Prize: Kapoko School (Mpika District).

103. In Barotseland the number of school gardens supervised by the department increased to twenty-five during the year. Good progress was registered in most of them and it has been possible to establish small paddy rice plots in conjunction with vegetable gardens at more than half of the schools.

AGRICULTURAL EDUCATION—AFRICAN

104. At Monze Agricultural Training School, thirty-two students completed the second half of the fifth course and thirty passed the final examination. The first half of the sixth course started with twenty-eight students in November, 1953, but the wastage has been high. Three were dismissed for misconduct and eight failed to make the grade in class, so that only seventeen were left to start the second part of the course. Greater emphasis has been placed on the quality rather than the number of students passing through the school, which to some extent accounted for the heavy culling in the new course. The department has now reached the stage when the African establishment is rapidly being filled and consequently it is possible to start raising the standard gradually.

105. At the Lunzuwa Agricultural Training School, near Abercorn, which has not been going as long as Monze, of the twenty-one students who finished the third course, eighteen were successful. Of twenty-six students who started the fourth course, three were dismissed, leaving twenty-three to continue on the second part of the course. Thirty-five potential entrants for the incoming fifth course were taken on for pre-training in practical work. It remains to be seen how many of them will be allowed to start, because it is at this stage that an endeavour is made to assess the qualities of character and personality.

106. Other activities at the schools included a special short course for thirty-six teachers at Monze in September. This has paved the way for a full one-year course specially designed for teachers, beginning in January, 1955. At Lunzuwa a special course for Agricultural Councillors in June—only five Councillors attended—two special courses for native authority employees in June and September—a total of fifty-five people attended—and a refresher course in August for the agricultural staff were arranged.

AGRICULTURAL EDUCATION—EUROPEAN

107. The pupil training scheme for tobacco continued to make " heavy weather ". Only one pupil has persevered and made a success, so far, of his course. European youths in this country are apparently not interested in this sort of training, presumably because it is rather dull. The prospects at the end of a three-year course, although admittedly unpredictable, are not unfavourable for a young man with a good knowledge of tobacco growing. It is, however, always a problem to find a suitable " ladder " for young people without capital to enter the farming industry and it is particularly difficult in this country with so many distractions and particularly the lure of the Copperbelt.

108. The conservation mechanical training course has been better. Two trainees completed their second year very successfully and one of them has proved a most apt and outstanding pupil in this particular specialised mechanical field.

109. As far as higher education in agriculture is concerned, there are several Northern Rhodesia youngsters studying at universities and colleges in the Union of South Africa. The department is directly concerned in the selection of candidates to fill the three or four places that are made available annually for Northern Rhodesia at the Gwebi Agricultural College in Southern Rhodesia. The course at Gwebi is of two years' duration qualifying for a diploma. The progress of the Northern Rhodesian students during 1954 was uneven. The three who completed the course were amongst the best ever to go through; they were medallists and one was the best student of the year. On the other hand, the three who started on the first year have not been able to maintain such a high standard. Many applications continue to come in for entry in the next year or two as far ahead as 1957.

110. One interesting new development in this sphere is the provision of an unusual prize presented by the Farmers' Co-operative Society in connection with the Northern Rhodesia Agricultural Society's Annual Show. The prize takes the form of a bursary or award to the value of £150 for an inter-district produce display; it may be used for furthering knowledge on agriculture through the provision of a college course or an educational tour or otherwise to a selected candidate from the winning district. The award in respect of the 1954 show is now under consideration by Mazabuka, the winning district.

SPECIALIST SERVICES AND EXPERIMENTAL WORK

Mount Makulu Central Agricultural Research Station

111. Building has again been a prominent feature of the year's work and good progress with the establishment of the station was maintained as shown in the following short list of works done:

(1) Administration, botanical and library block completed and in operation.

(2) Dairy building, including milking parlour, washing and cold rooms completed and in operation.

(3) Cattle feed store built and in use.

(4) Calf house, bull pens and loose boxes built, awaiting fittings but partly in use.

(5) Dutch barn erected.

(6) Spray race built and in operation.

(7) Five European maisonnettes completed and occupied. A manager's house nearly completed.

(8) Two servants' quarters, four double African staff houses and other African quarters built and occupied.

(9) Two sheds over boreholes and two kiosks for electrical supply built and in use.

(10) Three A.K. houses built to roof level and covered but not yet finished.

(11) Brick-making was continued on an increased scale. Seven hundred and fifty thousand bricks were made and burnt.

(12) A sprinkler-type overhead irrigation system was installed and in use during the dry season.

112. All sides of the work of the station made sound progress. With the arrival of two Plant Breeders in August and September there was a time, and for the first time, a full team of specialists. This happy state of affairs was short-lived, however, because the Soil Scientist having completed a useful tour of three years went on leave in November pending resignation. The fact is, however, that the latter half of 1954 saw the development of an attack on the Territory's agricultural problems on a much broader front than ever before. Chemical investigations, pasture work, plant pathology, wheat breeding and selection, variety and selection work on legumes and oil seeds were all proceeding by the end of the year. At the same time, the farming side of the station kept pace. The Jersey dairy herd was put onto machine milking, 250 tons of silage was made, a considerable quantity of hay was baled and stored, irrigation was developed. The arable programme was extended and improved, and eight rotational grazing paddocks of veld were demarcated and fenced. In short a balanced programme of research and demonstration is well under way. (For further details see Appendix II.)

Notes on District Stations and Seed Farms

113. In addition to the programme of experimental work carried out under the direction of the specialist officers concerned with particular problems, a limited amount of investigational work was done by agricultural officers in all provinces to assist in clarifying matters of local significance connected with agricultural development and extension in rural areas. (For further details see Appendix II.)

Rice Production

114. The Barotse Plain undoubtedly has a very considerable potential for rice and the department continued to concentrate its efforts on the extension and improvement of rice production in this area, not only to bridge the " hungry " gap but as a peasant cash crop. Actually there is no longer a need to " sell the idea " because paddy is now almost taken for granted. Along the eastern edge of the Central Plain, for example, where the people have learned how reliable a rice crop can be under difficult seepage and flood conditions, it is now looked upon as primarily a food crop for home consumption. In Mankoya, on the other hand, rice is primarily regarded as a new cash crop and it is not yet eaten to any extent by the people themselves. The growers in Senanga keep about half their crop and sell the other half. In short, rice has now been firmly established in the Barotseland economy, and it would seem that it is just a matter of time till a sizable surplus becomes available.

115. The hullers at Mongu and Mankoya worked satisfactorily. Additional machinery arrived and awaits installation at Mankoya; this includes a separator, a disc sheller, a husk aspirator, a No. 1 Grantex planters' mill, a reciprocating grader and a large prime mover. The buying, processing and marketing remained with the firm of Susman Bros. and Wulfsohn. On reviewing the price structure in relation to transport hulling and marketing costs, the firm suggested an increase in the producer price of paddy from 1½*d.* to 2*d.* per lb. and this came into effect in July. Actually the quantity of paddy offered for sale was only 500 bags (160 lb.) as compared with 1,342 bags last year. The reduction was due partly to producer resistance to the earlier price reduction from 2½*d.* to 1½*d.* per lb. and partly to a much greater consumption by the people themselves.

116. In the Eastern Province the weather was particularly unfortunate, resulting in the worst season since the project started five years ago. In the Mwapa area of the Petauke Valley, where a thriving rice industry has been developing, it has received a serious set-back Apart from the weather, however, competition with other crops, notably maize and groundnuts, is tending to divert attention from paddy cultivation, despite the efforts of the department, and interest is lacking. The figures of sales speak for themselves:

Season	*Bags paddy (150 lb.)*	*Bags native hulled rice (200 lb.)*
1950–51	818	165
1951–52	3,790	410
1952–53	2,034	420
1953–54	473	66

117. Prices remained unchanged at 24*s.* per bag paddy (150 lb.) and £2 8*s.* to £3 per bag (200 lb.) for native hulled rice. The Co-operative Marketing Union had no difficulty in disposing of the rice at favourable prices.

118. In the Northern Province, too, the sudden and very early cessation of the rains adversely affected production. The Bangweulu Marketing Union bought only seventeen tons of paddy as compared with thirty-nine tons in the previous year. Here again the bad season was but one factor.

119. Whereas before Federation poor-quality rice could be marketed without difficulty, the position to-day, with free movement within the Federation, is that rice from small mills lacking adequate machinery and native hulled rice cannot compete with the quality of the product from a highly developed mill, such as Kota Kota in Nyasaland. In short, therefore, although the department continues to demonstrate and encourage paddy growing wherever possible, and trials were in fact carried out this year at numerous centres in all provinces, it is obvious that further development of the crop for the trade must be confined to centres of high and economic production that can justify the installation of proper milling and marketing facilities.

Oil Palms

120. At Mulwe, near Lake Mweru, planting out was continued and by the end of January the nursery was cleared of seedling palms. As a result of the unusually short rainy season, an alarming number of the seedlings suffered very severely from drought during July and August. As a result mortality was high and by the end of the year there was a total of 354 seedlings of the three varieties, namely Local, Tenera and Dura. A further supply of Tenera and Dura seed has been obtained from Nigeria.

121. Lightning killed one palm tree, bringing to ninety-nine the number of trees in the villagers' gardens selected for recording. It will be a further two years before the records can be analysed with a view to choosing parent trees for breeding. Observations to date, however, show that there is a fair number of local palms with mesocarp percentages which compare favourably with Nigerian figures.

122. At Mubende in the Luapula Valley, three acres of irrigated palms have made exceptionally good progress. Routine bunch and fruit analysis was continued on the 100 recorded trees.

123. On Kilwa Island, in Lake Mweru, two one-acre blocks of palms were marked out at Kababa Mushitu—one of which will be kept cleared of weed growth for comparison with the other under its natural cover. Many palms on the island are showing signs of disease, and die-back is more obvious this year, possibly on account of the prolonged dry season.

Pilot Groundnut Scheme

124. As explained in last year's report, the scheme at Mukalaikwa in the Mumbwa District was changed to one of general investigation into the agricultural problems and possibilities of the area. Some aspects of the work carried out during this past season are included elsewhere (Appendix II) under the specialist services concerned. On the general agricultural side, however, careful costings were maintained on mechanisation which should be most useful when planning future programmes of agricultural development for the area.

125. The cattle have continued to progress satisfactorily despite a temporary set-back during a widespread outbreak of foot and mouth disease. The herd numbered 114 of all ages at the end of the year. The small demonstration herd of forty-four sheep also continued to make good progress.

126. A second European residence and additional African staff quarters were built and occupied during the year, to provide a base camp for extension services in the surrounding native areas, especially the Sala Reserve. This is in accordance with the policy to change the scheme into a general agricultural station, serving the area. In future, progress on this station will be included in the ordinary way in the appropriate section of the annual report.

Sugar Cane

127. The Gwembe Pilot Sugar Scheme was completed on 31st October when a decision was made to discontinue the present scheme. The decisive factor was the report of the soil survey of some twenty-four square miles in the immediate vicinity of the pilot scheme proper, which was concluded early in the year. This revealed that there was only a limited area of the really good soil and further that it would be very difficult to irrigate owing to the nature of the topography. Moreover there were considerable areas of land with a dangerously high sodium salt content which would require to be carefully avoided in any irrigation scheme. Nevertheless, it was agreed that the results of the 140 acres of trial plots merited further soil survey in an adjacent area of some sixteen square miles, in the hope of finding more suitable soil in a compact block that might justify the expense of a sugar factory. This further survey will not be completed until 1955 or 1956.

128. In the meantime, however, another factor affecting the issue was the decision of the Rhodesia Sugar Refinery Company Limited to go ahead on their own with the formation of a new company, to develop a small sugar plantation and factory across the river on the Southern Rhodesia side at Chirundu, where conditions appeared generally rather better and easier to develop. By the end of the year nearly 1,000 acres had been planted at Chirundu and a further 1,000 acres were being cleared. The Gwembe Scheme has been of assistance in the new venture in providing a readily available source of planting material of the varieties that had been proved best suited to local conditions.

LEGISLATION

129. The following Ordinances were enacted during the year:

No. 14 of 1954—The Land Bank (Amendment) Ordinance.

No. 24 of 1954—The Farmers' Stop Order (Amendment) Ordinance.

No. 31 of 1954—The Maize Control (Amendment) Ordinance.

PUBLICATIONS AND PUBLICITY

130. " Regulations Affecting Plant Imports: Guide for Importers ". By Dr. E. A. Riley.

" Alternaria Leafspot of Tobacco ". Plant Pathology Leaflet. By Dr. E. A. Riley.

" Anthracnose of Tobacco Seedlings ". Plant Pathology Leaflet. By Dr. E. A. Riley.

" Inoculation of Legume Seeds ". Plant Pathology Leaflet. By Dr. E. A. Riley.

" Anthracnose: A Serious Disease of Tobacco Nurseries in Northern Rhodesia caused by *Colletotrichum tabacum Boning* ". Tropical Agriculture Vol. 31 (October, 1954). By Dr. E. A. Riley.

" Review of Tobacco Anthracnose Problem ". Paper read at Commonwealth Mycological Conference, London. By Dr. E. A. Riley.

" Construction and Performance of an Oven for Plant Material ". Chemical Industry, 1955, p. 109. By E. Pawson.

" Maize Fertiliser Experiments in Northern Rhodesia ". Paper read at Second International Soils Conference, Leopoldville. By E. Pawson.

VISITORS

131. Mr. Oliver Lyttelton, Secretary of State for the Colonies.

Mr. W. L. Gorell Barnes, C.M.G., Colonial Office.

Lord Milverton.

Dr. G. V. Jacks, Commonwealth Bureau of Soil Science.

Dr. E. H. St. C. Flack, Managing Director, African Explosives and Chemical Industries (Rhod.) Ltd.

Mr. A. Blumbergen, Deputy Managing Director, Albatros Superphosphaten Ltd., Utrecht, Holland.

Mr. R. N. Wolton, Chairman, Fisons (Rhodesia) Ltd., Salisbury.

Mr. D. A. Tuttle, Managing Director, Central African Fertilisers Ltd., Salisbury.

Dr. H. Greene, Adviser on Tropical Soils, Rothamsted, England.

Dr. A. Muir, Head of Pedology Department, Rothamsted, England.

Dr. C. G. Stephens, Division of Soils, Waite Institute, Adelaide, Australia.

Mr. G. H. Burville, Commissioner of Soil Conservation, Western Australia.

Dr. E. B. Worthington, Secretary-General, Scientific Council for Africa South of the Sahara.

Mr. Robert Blum, Foreign Operations Administration, American Embassy, London, England.

Sir Christopher Cox, Educational Adviser to the Secretary of State.

Colonel B. R. McKenzie, D.S.O., D.F.C., Vice-President, Royal Agricultural Society of Kenya.

Mr. R. W. D. Fowler, Central African Department of the Commonwealth Relations Office.

Dr. E. K. Woodford, Agricultural Research Council, Unit of Experimental Agronomy, Oxford.

Mr. A. P. Biggs, Attache, American Embassy, Cairo, Egypt.

Lt.-Col. W. R. Hodgson, C.M.G., O.B.E., Australian High Commissioner, Johannesburg.

Mr. E. P. McClintock, Department of Commerce and Agriculture, Melbourne, Australia.

Mr. A. D. Chattaway, M.B.E., Federal High Commissioner, Pretoria.

Mr. A. J. Day, Australian Trade Commissioner, Johannesburg.

Mr. C. R. Enlow, Expert on Pastures, F.O.A. Pasture Mission.

Mr. W. L. Dutton, Expert on Range Management, F.O.A. Pasture Mission.

IN CONCLUSION

132. The year has seen great progress within the structure of the department, particularly upon the research side which has enabled a better service to be given to our farming industry than ever before. All officers are to be congratulated upon a very sound year's work.

C. W. LYNN,
Director of Agriculture.

14th March, 1955.

APPENDIX I

STAFF LIST AT 31st DECEMBER, 1954

Headquarters, Lusaka

C. W. Lynn, M.B.E., DIP. AGRIC. (WYE), A.I.C.T.A., Director (on leave).
M. Halcrow, O.B.E., B.SC. (AGRIC.), DIP. AGRIC. (CANTAB.), A.I.C.T.A., Acting Director.
C. E. Johnson, B.SC., DIP. AGRIC. (CANTAB.), A.I.C.T.A., Acting Deputy Director.
J. R. E. Hindson, B.A., A.I.C.T.A., Senior Agricultural Officer.
A. M. M. Rees, M.SC. (WALES), Agricultural Economist.
N. M. W. Irvin, Office Superintendent.
J. Meade, Assistant Accountant.
H. de B. Barwis, Acting Assistant Accountant (on leave).
D. A. Grobecker, Clerk.
Miss G. M. N. Briggs, Stenographer.
Mrs. L. Pulsford, Stenographer.
Mrs. G. K. Dawes, Registry Clerk.
Mrs. J. Graham, Temporary Clerk.
Mrs. D. A. Lightfoot, Temporary Clerk.
Mrs. J. Cobley, Temporary Part-time Clerk.

Specialist Services

J. H. Hinds, B.SC. (HONS.) (WALES), A.I.C.T.A., Pasture Research Officer, Mount Makulu Central Agricultural Research Station.
E. Pawson, B.SC., F.R.I.C., Agricultural Chemist, Mount Makulu Central Agricultural Research Station.
Dr. E. A. Riley, B.SC., D.I.C., PH.D., Plant Pathologist, Mount Makulu Central Agricultural Research Station.
B. E. Mounter, B.SC., Plant Breeder (Wheat), Mount Makulu Central Agricultural Research Station.
J. Smartt, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Plant Breeder (General), Mount Makulu Central Agricultural Research Station.
R. B. Symington, B.SC., D.T.A., Agricultural Officer, Mount Makulu Central Agricultural Research Station (on leave).
J. S. Blacklock, DIP. AGRIC. (GLAS.), DIP. DAIR. (GLAS.), A.I.C.T.A., Agricultural Officer, Mount Makulu Central Agricultural Research Station.
D. P. Hinton, B.SC., Agricultural Officer (Engineering), Mount Makulu Central Agricultural Research Station.
T. J. Greatrex, Agricultural Supervisor, Mount Makulu Central Agricultural Research Station.
Miss A. M. Lister, B.SC., Agricultural Supervisor, Mount Makulu Central Agricultural Research Station.
F. R. T. Hyam, B.SC., Agricultural Supervisor, Mount Makulu Central Agricultural Research Station.
K. L. Dubber, Research Assistant, Mount Makulu Central Agricultural Research Station.
Miss A. L. M. van Heerden, Learner Clerk, Mount Makulu Central Agricultural Research Station.
Miss A. M. Brodie, Learner Clerk, Mount Makulu Central Agricultural Research Station.
P. Lindeque, Building Foreman, Mount Makulu Central Agricultural Research Station (seconded from Public Works Department).

Copperbelt Land-use Survey

N. R. Brockington, B.SC., DIP. AG SC. (CANTAB.), Ecologist, Ndola.
Dr. A. O. Ballantyne, B.SC., PH.D., Soil Surveyor, Ndola.
E. M. Clegg, B.SC., Soil Scientist (on leave pending resignation).
Mrs. H. S. Williams, Temporary Clerk, Ndola.

Extension Services

Conservation Section

J. N. Clothier, DIP. AGRIC. (WYE), A.I.C.T.A., Chief Conservation Officer, Headquarters, Lusaka.
A. N. Beaumont, B.SC., Conservation Officer, Lusaka.
J. Mackenzie, B.SC., Conservation Officer, Choma.
G. L. Passanah, B.SC., Conservation Officer (on leave).
E. L. G. King, B.SC., Conservation Officer, Mazabuka.
B. W. R. Wilson, B.SC., Conservation Officer, Lusaka.
B. H. R. Christie, B.SC., Conservation Officer, Kalomo.
J. B. C. Kilfoil, B.SC., Conservation Officer, Broken Hill.
P. M. B. Brogan, B.SC., Conservation Officer, Chisamba.

J. P. Hughes, Acting Executive Assistant (on leave).
G. Rowlands, Clerk, Headquarters, Lusaka.
Mrs. H. E. Galer, Temporary Clerk, Headquarters, Lusaka.
P. G. Jones, Agricultural Supervisor, Lusaka.
S. W. Adamson, Agricultural Supervisor, Broken Hill.
M. W. de la Harpe, Agricultural Supervisor, Mazabuka.
A. F. Wilby, Agricultural Supervisor, Lusaka.
N. D. Thomas, Agricultural Supervisor, Mazabuka.
W. C. Verboom, DIP. AGRIC., Agricultural Supervisor, Choma.
W. H. Meyer, Agricultural Supervisor, Lusaka.
P. E. Anderson, Agricultural Supervisor, Lusaka.
G. M. Gunn, Mechanical Superintendent, Lusaka.
J. Wells, Mechanical Supervisor (on leave).
J. Mumberson, Mechanical Supervisor, Lusaka.
C. A. Holberry, Mechanical Supervisor, Lusaka.
E. J. Beckford, Mechanical Supervisor, Broken Hill.
F. Bensley, Mechanical Supervisor, Lusaka.
P. Prendergast, Mechanical Supervisor, Choma.
J. S. Drake, Mechanical Supervisor, Choma.
A. G. Morganti, Mechanical Supervisor, West Lusaka.
H. W. Thwaites, Workshop Mechanic, Lusaka
F. M. Duncan, Workshop Mechanic, Lusaka.
J. Martin, Workshop Mechanic, Lusaka.
E. C. Ward-Watson, Workshop Mechanic, Lusaka.
J. H. Jones, Workshop Mechanic, Lusaka.
R. E. Munro, Workshop Mechanic, Lusaka.
W. R. Howard, Stores Officer, Workshops, Lusaka.
M. A. Lendrum, Pupil Trainee, Workshops, Lusaka.
J. W. Reed, Pupil Trainee, Workshops, Lusaka.

TOBACCO SECTION

J. C. Collins, B.SC., Chief Tobacco Adviser, Headquarters, Lusaka.
A. Carr, Assistant Tobacco Adviser, Fort Jameson.
A. E. Twells, Assistant Tobacco Adviser (on leave pending resignation).
T. F. O'Callaghan, B.SC., Assistant Tobacco Adviser, Choma.
W. J. D. Watson, Assistant Tobacco Adviser, Broken Hill.
F. J. Barrett, Agricultural Supervisor (on leave).
L. C. Vaughan, Agricultural Supervisor, Mochipapa, Choma.
I. C. M. Paterson, Pupil Trainee, Msekera, Fort Jameson.
Mrs. P. M. Harrington, Stenographer, Headquarters, Lusaka.

SOUTHERN PROVINCE

J. D. Yelf, M.A., A.I.C.T.A., Agricultural Officer, Choma.
J. E. Mansfield, B.SC. (WYE), DIP. AGRIC. (READING), Agricultural Officer, Monze.
G. P. Broughton, Temporary Clerk, Choma.
Mrs. G. P. Broughton, Temporary Part-time Clerk, Choma.
E. P. Walsh, Agricultural Supervisor, Monze.
A. R. Machlachlan, Agricultural Supervisor, Monze.
A. S. Heaton-Smith, N.D.A., C.D.A., Agricultural Supervisor, Monze Agricultural Training School, Monze.
G. J. J. van Rensburg, DIP. AGRIC., Agricultural Supervisor, Magoye.
J. S. D. M. Johnstone, M.B.E., Agricultural Supervisor, Mapangazia.
P. W. Lake, Agricultural Supervisor, Gwembe.
E. G. Dabinett, Agricultural Supervisor, Kanchomba.
M. J. Lewis, DIP. AGRIC., Agricultural Supervisor, Mochipapa.
O. J. Gray, Agricultural Supervisor, Mapanza.
C. S. Mitchell, Principal Agricultural Supervisor (on leave).
B. J. O'Neil Shepherd, Agricultural Supervisor (on leave).
K. N. Bagshaw, DIP. AGRIC., Agricultural Supervisor (on leave pending termination of appointment).
African Agricultural Assistants—61.
African Agricultural Capitaos—11.

CENTRAL PROVINCE.

H. H. Roberts, B.SC. (AGRIC.), Agricultural Officer, Broken Hill.
G. N. Ball, Agricultural Supervisor, Broken Hill.
Mrs. S. C. Adamson, Temporary Part-time Clerk, Broken Hill.
D. T. Harwood, C.D.A., Agricultural Supervisor, Mumbwa.
R. Simms, Agricultural Supervisor, Serenje.
R. H. Howard, M.B.E., Principal Agricultural Supervisor, Sala.
A. F. Nicoll, Agricultural Supervisor, Sala/Mukalaikwa.
H. L. M. Hewitt, Agricultural Supervisor, Pilot Groundnut Scheme, Mumbwa.
J. H. Farwell, Agricultural Supervisor, Chalimbana Government Farm, Lusaka.
J. H. S. Perioli, Agricultural Supervisor, Chalimbana Government Farm, Lusaka.
E. C. Rose, DIP. AGRIC., Agricultural Supervisor (on leave pending resignation).
African Agricultural Assistants—34.
African Agricultural Capitaos—47.

Eastern Province

R. B. Reid, B.SC., N.D.A., Chief Agricultural Officer, Fort Jameson.
R. N. Coster, B.SC., D.T.A., Agricultural Officer, Petauke.
P. Greening, B.SC., D.T.A., Agricultural Officer, Ngoni Land-use Survey, Fort Jameson.
L. N. Raynor, Agricultural Supervisor, Fort Jameson.
K. D. Ransom, Clerk, Fort Jameson.
Mrs. T. A. Lemon, Temporary Part-time Clerk, Fort Jameson.
T. C. Bennett, C.D.A., Agricultural Supervisor, Fort Jameson.
J. M. Helliwell, Agricultural Supervisor, Petauke.
W. R. Lindsay-Stewart, Agricultural Supervisor, Kalichero.
J. Thomson, Agricultural Supervisor, Chadiza.
P. J. Fisher, Agricultural Supervisor, Katete.
G. B. Emslie, Agricultural Supervisor, Lundazi.
A. H. Farncombe, Agricultural Supervisor (travelling on first appointment).
W. A. Denchfield, Agricultural Supervisor (on leave).
African Agricultural Assistants—46.
African Agricultural Capitaos—118.

Western and North-Western Provinces

C. J. McK. Krige, B.SC. (AGRIC.), Chief Agricultural Officer, Ndola (on leave).
A. T. Wilson, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer, Ndola.
E. F. Dowdall, Clerk, Ndola.
Mrs. E. J. Wilson, Temporary Clerk, Ndola.
R. M. Wood, Agricultural Supervisor, Ndola.
R. O. Walker, DIP. AGRIC., Agricultural Supervisor, Kambowa (on leave).
G. McI, Burnie, Agricultural Supervisor, Kambowa.
G. W. E. Pickworth, N.D.A., C.D.A., Agricultural Supervisor, Kambowa.
J. G. C. King, Agricultural Supervisor, Kabompo.
P. A. Henderson, Agricultural Supervisor, Kasempa.
E. L. de S. Mason, DIP. AGRIC., Agricultural Supervisor, Kasempa.
African Agricultural Assistants—25.
African Agricultural Capitaos—52.

Northern Province

J. A. Allan, B.SC. (AGRIC.) (GLAS.), Agricultural Officer, Kasama.
J. H. Rhodes, B.SC., DIP. AGRIC. (CANTAB.), D.T.A., Agricultural Officer, Lunzuwa.
I. L. Edwards, Agricultural Supervisor, Kasama.
Mrs. D. H. Bowers, Temporary Part-time Clerk, Kasama.
E. R. Woollard, DIP. HORTICULTURE (WYE), Agricultural Supervisor, Lunzuwa Agricultural Training School.
A. C. Downer, N.D.A., C.D.A., Agricultural Supervisor, Lunzuwa.
W. V. Morony, Agricultural Supervisor, Isoka.
P. M. McIntyre, Agricultural Supervisor, Isoka.
D. F. Wallace, Agricultural Supervisor, Luwingu.
J. M. Frew, Agricultural Supervisor, Kawambwa.
African Agricultural Assistants—61.
African Agricultural Capitaos—68.

Barotse Province

F. Durocher-Yvon, M.B.E., DIP. AGRIC., Agricultural Officer, Mongu.
A. D. McLeod, Agricultural Supervisor, Mongu.
J. H. Alder, Agricultural Supervisor, Mankoya.
B. N. de Vicq, DIP. AGRIC., Agricultural Supervisor (on leave pending resignation).
African Agricultural Assistants—19.
African Agricultural Capitaos—27

APPENDIX II

ANNUAL PROGRESS REPORT ON SPECIAL INVESTIGATIONS AND EXPERIMENTAL WORK IN 1954

Agricultural Chemistry

The Agricultural Chemist represented Northern Rhodesia at the second Inter-African Soils Conference, and at the fifth International Congress of Soil Science, both held at Leopoldville. A paper was presented to the Conference entitled " Maize Fertiliser Experiments in Northern Rhodesia ".

2. The fitting up of the chemistry laboratory was completed. A considerable amount of new, time-saving equipment was designed and constructed; improved equipment and methods were investigated and set up for the determination of potassium, exchangeable bases, hydrogen, organic carbon, pH, crude fibre. This has helped to offset the smallness of the staff when demands were heavy. A large forced-draught oven for drying plant samples has been designed and constructed: it has enabled the analysis of maize and sunnhemp plants to be carried out sooner than would otherwise have been possible.

3. The programme of field experiments was continued with the assistance of the Agricultural Officer (Experiments) and the provincial officers. Eighteen maize experiments, one kaffir corn experiment, two groundnut and three tobacco experiments were carried through and statistically analysed.

4. It was pointed out that the exploratory stage, establishing the main general trends of fertility on the maize soils, was concluded in 1953. In the period 1953–1955, the field experiments are being replaced and extended in scope and, now that laboratory facilities are available, the chemical characteristics of the soils are being studied in detail. In addition, the chemical composition of sunn-hemp and maize plants is being studied. The integration of the laboratory studies and five years' field work should enable the fertility status of the maize soils to be accurately characterised for the first time in this Territory.

5. The result of all the work this year on maize fertiliser requirements completely confirms the previous findings that the pre-eminent nutrient is nitrogen; phosphate is very important on certain of the soils; and under the present conditions in the soils excellent yields are obtainable without adding potash. This position would, of course, have to be watched with continued cultivation.

6. Owing to favourable factors that appear to have been operating all experimental yields, including those of unfertilised plots, were far higher than those of the previous season. Some phenomenally high yields were reached, e.g. twenty-three bags an acre on a very poor sand, thirty-three bags an acre at Monze and thirty-five bags in the Eastern Province were quite unexpected. At the last-mentioned site, one plot yielded at the rate of exactly forty bags per acre.

7. With regard to starter mixtures, the previous conclusions were again confirmed. All experiments to date have failed to show any advantage from the use of maize mixture (" D "), as compared with straight superphosphate. This has been the case whether the crop has responded to phosphate or not.

Soil Survey

8. A Land-use Survey of the Copperbelt was started in March, 1954, and the field season extended until the end of September. During this period 1,100 square miles of country were surveyed by means of parallel traverses one mile apart with recordings of soil and vegetation every 1,000 feet along the traverses. In the initial stages progress was slow but, once the soil pattern had been ascertained and the soil types defined, progress was much faster. It is hoped that the remaining 1,600 square miles will be mapped in the coming field season.

9. So far it has been found that soil colour can be used as an indicator of agricultural worth—generally the redder the colour the better the soil. This, however, will have to be proved by field experiments with various crops. Of the area so far surveyed, roughly that enclosed by a triangle joining Mufulira, Ndola and Luanshya, the parent material of the soil has been of rocks of the Basement Complex. The coming season's work, however, will include areas of the newer Roan Series and there are indications that there will be a change in soil types from those already defined.

10. An attempt has been made to classify dambos with regard to agricultural usage. Two dambos near Ndola were selected—one of predominantly sandy type, the other predominantly clay. Intensive large-scale soil maps of these dambos were made and sites selected for plots. These plots will be used to assess the grazing potential, the length of the grazing season and the nutritive value of the natural dambo grasses.

11. A large-scale soil survey of the Kambowa Agricultural Station has been completed. This will be used to compare the soil types on the station with the soil conditions prevailing in the Copperbelt. This is necessary for the best application of the results of experimental work on Kambowa to Copperbelt agriculture.

Ecology

12. The Ecologist spent the dry season until the end of September with the land-use team in the field, collecting data on soils and vegetation for the Copperbelt survey. A visit to Elisabethville was made during the field season for discussions with a team of Belgian workers conducting a similar survey. This visit proved interesting and instructive.

13. After the conclusion of the main field work a start was made on the construction of vegetation maps with the aid of aerial photographs, but the initiation of a programme of grassland research at Kambowa Agricultural Station and preliminary observations on the grazing possibilities of certain dambos became an obvious necessity and occupied a large proportion of the remainder of the year.

14. By the end of 1954, the current season's grassland work at Kambowa was well under way and plans had been formulated for further work during 1955 and 1956. The present season's work includes a spacing and variety trial of local and Gold Coast varieties of Elephant grass, a liming and variety trial using three strains of lucerne, and the trial of some two dozen grazing and fodder plants in cutting and observation plots both under irrigation and " dry-land " conditions.

Plant Pathology

15. The existence of a Pathologist with a laboratory has become widely known in the Territory and as a consequence the number of routine jobs has tended to increase including advisory visits to all the main farming areas. Three hundred and fifty-four specimens were received for diagnosis as compared with 205 in the previous year. Attention was also given to plant quarantine and legislative matters, in particular the question of Bacterial Canker of tomatoes which necessitated a visit to South Africa.

16. Work on Tobacco Anthracnose (*Colletotrichum tabacum Boning*) was continued. Of some twenty-five fungicides tested for effectiveness, only two, " Zineb " and " Captan ", proved satisfactory under greenhouse conditions. Field tests with " Zineb " were carried out in November/December, 1954, and several farmers used the fungicide as a routine spray. Results have been most gratifying, the fungicides not only providing protection against infection but also in checking severe outbreaks where these occurred.

17. In an experiment to test the effect of boron on tobacco in the Eastern Province, where a deficiency was suspected, there was an indication of increased yield when borax was applied at the rate of four lb. per acre. There were indications that this rate of application was still insufficient.

18. Small-scale experiments to test the effect of various N.P.K. ratios on the severity of *Alternaria* leaf spot did not yield any significant results. However, in a farm survey it was observed that the general use of fertilisers containing increased amounts of phosphorus and potash appeared to have lowered the incidence of severe leafspot in the 1953–54 season. The fertiliser ratio that appeared the most satisfactory overall was N.P.K. 1 : 3 : 3, the best growth and least disease being recorded on crops fertilised along these lines.

19. Experiments with MCPA as a pre-emergence spray for control of weeds (in particular grasses) in maize lands proved very disappointing. The experiments were carried out on both heavy loam and sandy soils but in neither case was yield increased by the use of one or two lb. acid equivalent MCPA per acre, although an obvious temporary check to weed growth was achieved. A single cultivation proved of the same order of effectiveness as 2 lb. MCPA on the sand soil but gave yields more than double those of 2 lb. MCPA on the loam. The experiments are in course of repetition. Trials with 2 : 4 : 5 T against *Lantana camara L* have shown that aqueous solutions of 4 per cent. applied to cut stems will kill Lantana. Sprays applied to foliage or stem bases are not effective.

20. Trials with 2 per cent. aqueous 2 : 4 : 5 T and 7.5 per cent. aqueous Ammate against various shrubby species in an indigenous grass paddock gave the following results: 2 : 4 : 5 T killed *Acacia* spp., *Albizzia* sp., *Trichodesma physaloides*, *Triumfetta amuletum* and *Philiostigma thonningii*, while Ammate controlled only the *Trichodesma*.

21. The appearance of rust (*Puccinia polysora Underw*) on maize in 1953 was not followed by widespread outbreaks in 1954. *P. polysora* was recorded from only one station, Petauke, on Southern Rhodesia hybrid. Hickory King and Namalenga plantings in the vicinity remained substantially free of the disease. Blight (*Helminthosporium turcicum Pass*) and Streak (Virus) were the most serious diseases of maize in 1954. Blight was widespread and severe in Southern Rhodesia hybrid and general native types, causing premature death of some of the latter. Streak was responsible for severe stunting of maize growth in the Broken Hill and Mukalaikwa areas.

22. Leafspot (*Cercospora arachidicola Hori*) and Rosette (Virus) were the most serious diseases of the groundnut crop. Little damage was done by either disease on small-scale plantings but large areas are usually severely affected by both. Local varieties of nuts were found to be less affected by leafspot and Rosette than Natal Common under comparable conditions. Crown Rot (*Aspergillus niger v Tiegh*) appeared over a small section of the Pilot Groundnut Scheme in mid-season. East Africa reports indicate that the use of " Thiram " in place of mercury seed dusts greatly reduces the incidence of Crown Rot; this has therefore been recommended for trial in the 1954–55 crop.

23. Die-back of limes, previously reported as due to inadequate nutrition, has now been confirmed as being of virus origin. Citrus viruses (in particular stem-pitting or Tristeza) are widespread in Northern Rhodesia on most species of citrus. Limes and grapefruit, as elsewhere, have proved the most sensitive to infection. Double Virus Streak (Tobacco Mosaic virus and Potato Virus X), a serious and disfiguring disease of tomatoes, was recorded for the first time in the Copperbelt. A further virus disease, as yet undetermined, was recorded from tomatoes near Lusaka. The latter causes ring patterns on the leaves and yellow blotches on the fruits. Collar Rot (*Phyphthora citrophthora* (Sm. and Sm. Leonian)) was found affecting a large number of citrus trees in an orchard near Lusaka. Complete recovery was obtained by scraping off the bark and the use of Bordeaux paint.

Pasture Research

24. The herbarium collection now contains 551 sheets of specimens, much excellent material having been donated by Father E. A. Robinson of St. Mark's College, Mapanza, and by Mr. Vesey-FitzGerald of the International Red Locust Control Service. One hundred and sixty-seven grasses, sixty-two sedges and five legumes have been authoritatively named by Kew to date. The named grass collection (representing, however, only about half the number of grass species known to exist in Northern Rhodesia) includes a number of new records for the Territory, e.g. *Phyllorachis sagittata* Trimen. and *Hylebates cordatus* Chippindall.

25. The development of plant introduction and bulking plots did not go very far forward in the early part of the year and only a dozen or so species were grown in the nursery during the dry season, mainly lawn grasses and other vegetatively propagated grass species. A few beds of the commoner pasture grasses (Makarikari Panicum, Bambatsi Panicum, No. 2 Naivasha Star Grass, Giant Rhodes Grass and *Cenchrus ciliaris*) were established in March and cross-stripped with sowings of Legumes (lucerne, *Centrosema*, *Stylosanthes*, *Lespedezas*, etc.) to see if any compatible grass–legume mixture could be isolated. The sudden ending of the rains prevented most of the legumes from taking nor was it possible to irrigate. Lucerne, however, survived and looked reasonably promising in association with *Cenchrus ciliaris* though the mixture has not been subjected to cutting or grazing treatments. The grass–legume plots will be re-established in the 1954–55 rainy season. By the close of the year the nursery and grazing trial plots had been fenced off and planted up to some extent though the season has so far been a very difficult one.

26. Attempts at making cheap surface silage in the form of wedges and buns from veld grass with a buck rate were not successful as no suitable method of sealing the stacks was found. Two hundred and thirty tons of maize and maize–legume silage made in trenches proved very satisfactory. An analysis of one pit showed a pH of 3.88, a dry matter content of 25 per cent. and a crude protein content of 8 per cent. of dry matter; density averaged about half a ton per cubic yard. The temperature of this pit attained a maximum of 106 degrees Fahrenheit.

27. As foreshadowed in the last annual report, one of the main lines of work to be undertaken is a study of methods of establishment of sown pastures, and in the latter half of the year four trials were laid down to compare broadcast versus different machine sowing of Rhodes Grass, to test the effect of rolling treatments on establishment, and to see what effect different times of sowing coupled with different levels of fertiliser applied to the seedbed had on establishment.

28. Two experiments on Rhodes Grass seed production, one involving fertiliser treatments and the other simple management treatments, are also in progress.

29. The rapid development of Lusaka has involved the creation of many new lawns and several new sports grounds and the Pasture Research Officer has been called in frequently for advice and information on methods of establishment, choice of grass to use, etc. Assistance has been rendered towards the Kabulonga Schools' playing fields and lawns, the Golf Club and the proposed Lusaka Stadium. A fair number of different grasses suitable for lawns, bowling greens, etc., are being bulked up at Mount Makulu for future trials and for issue. Small quantities of planting material have been given to interested nursery men to increase, there being no lawn grass nurseries in Lusaka at the present time, despite a fairly strong public demand for roots.

30. A small meteorological station under the charge of the Pasture Research Officer was set up at Mount Makulu incorporating a Stevenson screen with the usual range of thermometers; 2 inch, 4 inch and 8 inch earth thermometers; grass minimum thermometer; rain gauge and autographic rain gauge. The Federal Director of Meteorological Services attended an informal departmental conference convened at the Agricultural Department Headquarters in Lusaka on 19th August to discuss agricultural meteorology and allied topics.

Plant Breeding

31. Two Plant Breeders assumed duty during the latter half of the year and the work was divided into wheat as a whole-time project, and general, with particular reference to pulses and oil seeds. Supervision of the groundnut trials at Mukalaikwa has been taken over by the Plant Breeder (General). A variety trial and an isolation dormancy trial are now in hand. A collection of groundnut varieties numbering 150 has been established and will be kept under constant observation for leafspot and rosette attack; dormancy relations will also be studied in 1955.

32. A variety collection of *Phaseolus vulgaris* and other edible pulses is being established. Local material has been collected and also a number of varieties and selections from various parts of the world. From this material it is hoped to select a bean suitable for use in a rotation with maize. Effect of planting date on production will be studied on a small scale.

33. A Plant Introduction Register was started in February, 1954, and since August has been kept by the Plant Breeder. Since its beginning, over 600 entries have been made.

34. Many varieties of wheat have been included in successional sowing trials this summer, each variety being sown on six dates at four weekly intervals. The first sowing was made on 15th December. Detailed observations are to be made on the characters of straw and grain and, in particular, on rust incidence, in an endeavour to find the most suitable date for sowing summer wheat.

35. Further large collections of wheat varieties have been obtained from the United States Department of Agriculture International Rust Nursery and from the Food and Agriculture Organisation Near East Rust and Bunt Nursery at Rome, Italy. In addition to furthering international knowledge by studying the disease reactions of these collections, they are expected to provide valuable sources of breeding material. These collections were sown in mid-December. In all, well over 500 different varieties of wheat are being sown this season.

Irrigation

36. With a view to establishing a small experimental station on the Kafue Flats, five possible sites were examined in some detail, three being on the north and two on the south bank of the river. The most likely site is adjacent to the Chiansi Lagoon to the west of the Chilongolo River and arrangements are now in hand for developing fifty acres by the end of 1955.

37. At Chalimbana Agricultural Station methods of surface and overhead irrigation were investigated. One field was laid down to border irrigation, the width, length and gradients being varied and using rubber siphons.

38. In connection with the Gwembe Pilot Sugar Scheme, a further detailed search was made for other possible sites downstream from the Kariba Gorge and on the lower Kafue. An area near Chief Chiawa's Village appeared to be worth more detailed investigation by a soil scientist, and this will be done as soon as the necessary staff can be spared from other high priority jobs.

39. During the 1952–53 season it was observed that seedlings grown in beds watered by capillary action looked healthier and that growth was definitely more rapid than in seedlings grown in standard pattern beds. It remained to prove, however, that such seedlings could stand up well to field conditions as those grown under standard conditions, and accordingly a supply was distributed to certain growers for trial under field conditions. In every instance the report was favourable. The main disadvantage is the expense involved in the construction of capillary beds because of the large quantities of bricks involved. Growers who are interested in this method of seedling production can obtain particulars from the department.

40. In the " battle " against anthracnose one grower in the Kalomo area tried a grass mulch on his beds without any overhead covering, and as the result in so far as growth was concerned appeared favourable, it was decided to ask farmers in different areas to try out this form of seed bed culture. In every instance the results were most satisfactory; so much so that instead of the farmers adhering to the original plan of one experimental bed to every six non-experimental the majority soon switched over entirely to grass mulch. One farmer experienced hail on his beds and although at first sight the damage done to the uncovered grass mulch beds was far more severe than that sustained by seedlings grown under cover, within a week there was no appreciable difference regardless of whether the seedlings at the time of the storm were very small or as large as five weeks old. The principal advantages of seedlings treated with grass mulch are—

(1) No posts or supports are required.

(2) No expense is involved in cutting or combing grass or in buying cheese cloth.

(3) Less water need be applied.

(4) The seedlings are at least seven to ten days ahead of plants grown under grass cover.

(5) There is an excellent development of fibrous roots but unfortunately there is a tendency for the top roots to grow rather long.

(6) Supervision and observation are considerably enhanced because of the absence of covers.

41. The question of whether to prime or not to prime has become a very controversial subject and so an experiment was designed to include four treatments, viz:

(1) A very light priming—removal of two leaves.

(2) A moderate priming—removal of four leaves.

(3) A very severe priming (as advocated for the control of wild-fire or severe angular spot in young plants)—removal of all leaves right up to the bud.

(4) No priming—control.

The results may be summed up as follows:

(i) It was found that growth in the control plots was considerably in advance of all other treatments and that the plants tended to reach maturity earlier than did the primed plots.

(ii) At the time of first reaping it was found necessary on the plots of treatment (1) to remove and discard one or two leaves per plant as not worth curing. In plots of treatment (2) only an occasional leaf had to be discarded. In plots of treatment (3) practically no leaf had to be discarded. In the control plots an average of three leaves, not including obvious seedbed leaves, had to be discarded.

(iii) Control plots gave slightly longer and slightly more bodied leaf than treated plots. Barn-spot, however, was more prevalent in the plants which had not been primed. The incidence of frog-eye as observed in the field and expressed mathematically was in the ratio of—

Treatment (1)— 5.
Treatment (2)— 2.
Treatment (3)— 0.
Treatment (4)—10.

Alternaria was present in all plots, the intensity of infection being about the same throughout.

(iv) An analysis of cured and graded leaf gives the following results:

Treatment	*Yield of cured leaf (lb. per acre)*	*Grade index*	*Value per acre (units)*
1	1,258	36	45,288
2	1,136	36	40,896
3	985	36	35,460
4	1,322	35	46,270

In short, the highest value per acre was obtained from plots in which the plants were not primed and that the more severe the priming the lower the return per acre, the lowest return being obtained, as is to be expected, from plots in which the plants had been subjected to excessively severe priming.

42. Twelve varieties were tried out in the light bodied sandy soils of the Mochipapa Experimental Station at Choma, and eight varieties on the fine grained red sandy loam soils of the Msekera Experimental Station at Fort Jameson. Combining the results of this season's work with those obtained in previous years and bearing in mind that the 1953–54 programme included varieties which had not been tried out previously and so are ignored for this particular purpose of comparison, it appears that Jamaica Wrapper and, to a lesser extent, Yellow Mammoth and Delcrest are not suited to the conditions prevailing at Mochipapa. On the other hand, Willow Leaf and C/7 are very suitable. White Stem Orinoco has not proved consistent. As far as Msekera is concerned the results have been less consistent. In 1951–52 the highest cash returns per acre were obtained from Jamaica Wrapper, Gold Dollar and Yellow Mammoth; in 1952–53 from C/10, Willow Leaf and Yellow Mammoth and in 1953–54 from Hicks Special, Virginia Gold, Hicks Broad Leaf, Delcrest and Bonanza.

43. A steam curing unit supplied by Messrs. Reunert and Lenz was tried out on the Mochipapa Experimental Station. A barn of cutters and a barn of tops were cured. The principal points to emerge were—

(1) Any desired degree of humidity can easily be obtained. The unit stays set at the desired temperature and humidity for an indefinite period of time, but is, to a slight extent, affected by outside temperatures.

(2) Colouring is more rapid than in standard barns.

(3) The leaf can be removed from the barn in two hours.

(4) The time saved in curing means a more rapid turnover of barn accommodation.

(5) Disadvantages are the relatively high cost of the equipment and the necessity of having a high-powered boiler to operate the units.

44. During the season a detailed study of soils and the response of fertilisers and varieties of flue-cured tobacco was conducted on more than 100 farms dispersed throughout the Eastern and Western areas.

45. In addition, samples of leaf were drawn from the auction floors at the time of the sale and after being sorted into three main groups, viz:

(1) Highly acceptable to the United Kingdom market,

(2) Acceptable to the United Kingdom market,

(3) Not readily acceptable to the United Kingdom market,

were analysed for the total nitrogen content of the cured tobacco. The result of the chemical analysis of cured leaf shows that there appears to be no significant difference in the total nitrogen content of leaf " highly acceptable to the United Kingdom market " and leaf which is " not readily acceptable to the United Kingdom market ".

NOTES ON TRIALS AT DISTRICT STATIONS AND SEED FARMS

46. A certain amount of experimental work was carried out at provincial and district level and, although this was of limited scope, some of the results were interesting.

Southern Province

47. In a replicated maize variety trial at Magoye, the results were—

Southern Rhodesia Double Hybrid	15.0 bags per acre.
Hickory King	14.7 bags per acre.
South Special	12.3 bags per acre.
Eldridge Hybrid	11.9 bags per acre.

Western Province

48. On the sub-tropical fruit section of the Kambowa Agricultural Station, which serves the Copperbelt, a carefully planned series of variety and cultural trials have been initiated on a wide range of possible tree, orchard and garden crops, including citrus, banana, pawpaws, avocadoes, granadillas, grapes, peaches, guavas, figs, pineapples, youngberry, Himalayan blackberry, white sapote, mangoes, litchis, tree tomatoes, strawberries and vegetables. Comprehensive data were recorded and are available if required, but it is felt that several years' experience is desirable before the results are publicised. As an example of the scope of the work, 1,221 citrus seedlings were budded in 1954, to twenty-two different varieties.

49. In a trial of different types of beans at the Njenga Seed Farm, Kasempa, soya beans yielded at the rate of 595 lb. per acre, as compared with Red Canadian Wonder at 121 lb. per acre.

Eastern Province

50. Two experiments with Burley tobacco were carried out at Petauke Agricultural Station. One experiment was begun in 1950 and is designed to find out how tobacco can be included in a rotation with the other crops normally grown in the district. The results to date have indicated that Burley tobacco can, in fact, be included in a rotation quite successfully. Rotations including the ploughing in of a green manure crop have given best results.

51. In a trial of three varieties of Burley tobacco, viz: White Burley, Kentucky 41 and Barnett Special gave mean yields of 880, 732 and 745 lb. per acre respectively. Although the result was not statistically significant, the trend was the reverse of what has been found in previous years.

52. On poor sandveld at Chadiza, an interesting observation was that Striga infestation in maize, which is normally very severe, was appreciably less on the plots treated with sulphate of ammonia in a maize fertiliser trial.

53. At Lundazi three replicated experiments were carried out on cotton with useful results:

(*a*) Spraying versus dusting insecticide (D.D.T.) at four concentrations indicated that chemical insecticides effectively increased the total yield of seed cotton by 50 per cent. and the proportion of clean as compared with stained. The optimum economic rate of application has not been determined. There is no difference in effect between spraying and dusting.

(*b*) In a trial of various dates of planting the results confirmed previous experience that the earlier the better. Dry planting before the onset of the rains gave the best yield.

(*c*) A spacing trial showed that three feet × two feet was the optimum distance in this relatively dry year. In a wet year experience has shown that three feet × two and a half feet is probably better.

54. In a trial of five varieties of sorghum at two centres in Lundazi District the variety Mpiwe was outstanding in both trials. It is early maturing and, to some extent, resistant to birds.

Northern Province

55. In a trial of finger millet cultivated, i.e. not the indigenous method of broadcasting the seed on the ash in burnt gardens, the yields were—

	Yield
Manured with farmyard manure at twelve tons per acre	8 bags per acre.
Manured with farmyard manure at four tons per acre	2½ bags per acre.
Control—no manure	1¾ bags per acre.

56. At two centres, Misamfu and Lunzuwa, an interesting experiment was started to obtain information on the amount of manure which can be made by livestock of various classes, using different amounts of litter, with and without supplementary watering during dry periods. It is too early yet to publish figures from this experiment but the results to date indicate that the findings will be interesting and useful.

Barotseland

57. In a rice variety trial, including four varieties that have done best in the past, the yields were—

Nyasaland Faya (ex Kota Kota)...	2,783 lb. paddy per acre.
Burma	2,783 lb. paddy per acre.
Tanganyika Faya	2,644 lb. paddy per acre.
Angola Crystal	1,886 lb. paddy per acre.

This result confirmed the wisdom of the policy to develop the industry on the basis of Nyasaland Faya which, apart from its high yielding ability, has other desirable qualities on the milling and marketing side.

58. Nyasaland Faya was the variety used in a cultural experiment which gave the following results:

Transplanted from nursery	2,571 lb. paddy per acre.
Broadcast as seed	2,262 lb. paddy per acre.
Dibbled as seed	2,044 lb. paddy per acre.

59. A much bigger experimental programme has been planted for the 1954–55 season. This includes observation plots on a large number of rice varieties, including twelve selections from previous years, nine varieties from Texas, U.S.A., and a deep water variety from Indo China. In all, twenty-six acres were planted to rice on the station. In addition, variety trials with maize, sorghum and sugar cane have been planted this season.